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and

Surgery of Trauma

Volume 18 July 1949 Number 7

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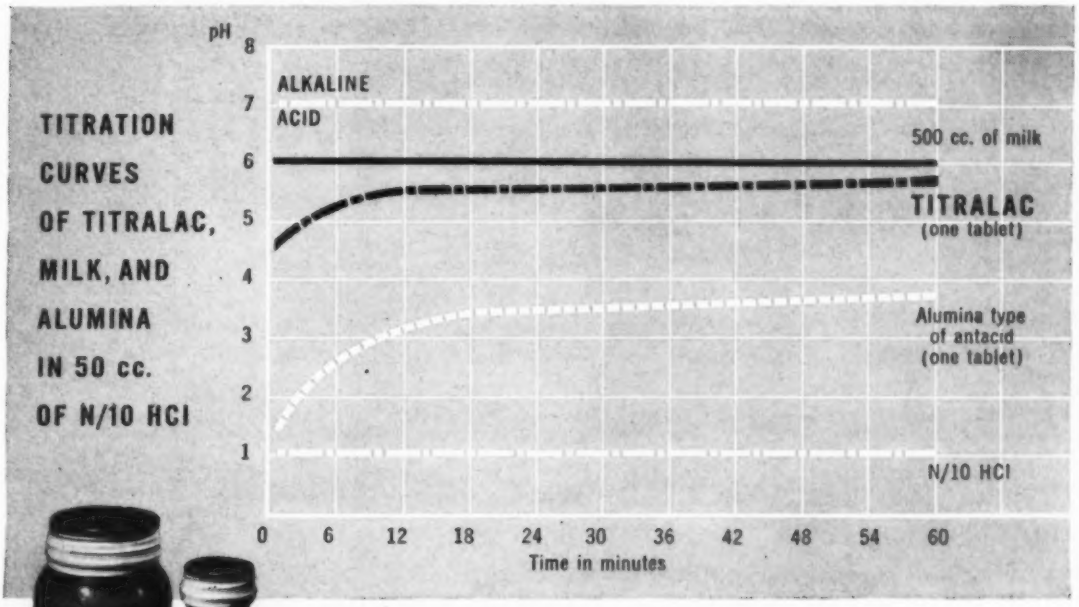

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MAX R. BURNELL, M.D.

DR. MAX R. BURNELL, was born at Metamora, Michigan, October 6, 1893. He was graduated from the University of Michigan with an M.D. degree in 1918 after studying at Albion College. From 1918 to 1921, he was resident instructor at Long Island College Hospital. Returning to Flint in 1921, he started in practice with his father, the late DR. BYRON E. BURNELL, prominent in Michigan medical circles for many years. DR. BURNELL is a former chief-of-staff of the Women's Hospital, Flint; member of the executive committee of the medical staff at Hurley Hospital, and chairman of its surgical advisory committee; chairman of the Clara Elizabeth Fund's Medical Advisory Board; and a member of the American College of Surgeons, the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, and the American Medical Association. He organized the Medical Department at AC in 1931. It was one of the first industrial medical departments in America to be certified by the American College of Surgeons, and its modern equipment and advanced techniques have long been recognized as outstanding in medical circles throughout the country. This department was signally honored when the American Medical Association requested the AC Division to demonstrate at the AMA Convention in Chicago, the AC plan for placement of World War II veterans, a plan nationally recognized as a model system.

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Vasomotor Rhinitis	133	87	65.4	8
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Urticaria	48	39	81.2	11.5
Angioneurotic Edema	12	8	66.6	0
Contact Dermatitis	18	12	66.6	7.6
Atopic Eczema	17	14	82.3	40
Serum Sickness	3	3	100.0	0
Migraine	10	7	70.0	25
Allergic Headache	5	3	60.0	0
Drug Allergy	2	2	100.0	0
	999	644	64.5	10.9

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American College of Surgeons, 40 East Erie St., Chicago 11, Ill.

American Conference of Governmental Industrial Hygienists, U.S. Public Health Service, Washington, D.C. J. J. BLOOMFIELD, Secy-Treas.
April 23-29, 1950, Chicago.

American Industrial Hygiene Association, 4400 Fifth Ave., Pittsburgh 13, Pa. HENRY F. SMYTH, JR., Executive Secy.
April 23-29, 1950, Chicago.

American Medical Association, Council on Industrial Health, 535 North Dearborn St., Chicago 10, Ill. CARL M. PETERSON, M.D, Secretary.

THEODORE F. HATCH has been named Professor of Industrial Health Engineering in the Graduate School of Public Health at the University of Pittsburgh.

EFFECTIVE May 16, 1949, DR. D. L. LYNCH, Roslindale, Massachusetts was appointed Consultant in Industrial Health for the V. A. area of Boston, which comprises all of New England and New York State. At the annual meeting of the Massachusetts Medical Society on May 24, DR. LYNCH was appointed Chairman of the Section on Industrial Health.

NATIONAL Association of Manufacturers has appointed a group of physicians to act in an advisory capacity to the Association's Committee on Industrial Health and Safety. The new appointees are DR. GEORGE H. GEHRMANN, DR. T. LYLE HAZLETT, DR. CHARLES-FRANCIS LONG, DR. CLARENCE D. SELBY, DR. JOHN J. WITTMER, DR. M. H. MANSON, DR. J. H. WAGNER and DR. McIVER WOODY.

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Association for the Surgery of Trauma.

Canadian Public Health Association, Vancouver, B.C., Canada.

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September 12-18; New York.

Lead Industries Association, 420 Lexington Ave., New York 17, N.Y. ROBERT L. ZIEGFELD, Secretary-Treasurer.
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National Council on Rehabilitation; Secretary-Treasurer: MR. HOLLAND HUDSON, 1790 Broadway, New York 19.

National Metal Congress, Philadelphia.
October 25-28; Philadelphia.

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National Safety Council, 20 North Wacker Drive, Chicago 6, Ill. NED H. DEARBORN, President; CARMEN FISH, Secretary.
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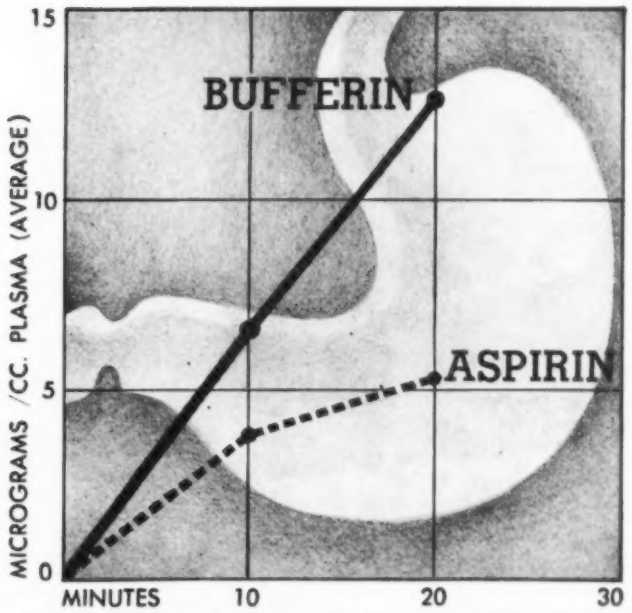

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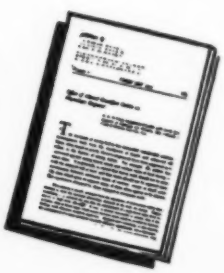
Controlled Study
CONFIRMS IMPORTANCE OF
Morning Meal

A study* recently concluded at the Departments of Physiology and Nutrition of the college of medicine at a distinguished university established that the value of an adequate breakfast, as recommended by nutrition authorities, is definitely reflected in maximum work output and mental acuity during the pre-noon hour.

It also demonstrated that the long continued omission of breakfast detrimentally affects maximum work output, simple and choice reaction time, and neuromuscular tremor.

Under adequately controlled conditions data were collected on the effects of four different breakfast habits on the maximum work output, mental acuity, and neuromuscular tremor of six young women ranging from 22 to 27 years in age. The breakfast habits investigated constituted habituation to an 800 calorie breakfast, effects of which were considered the critical standard, to no breakfast, to coffee only (1 cup of coffee, 1 ounce of cream, no sugar), and to a 400 calorie breakfast.

*Reprint of the study referred to will be sent on request.

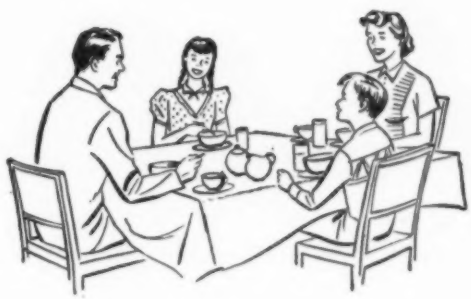


From the data gathered the following conclusions were reached:

1. When "no breakfast" was the morning habit, maximum work output showed a significant *decrease*, while a notable *increase* resulted in simple and choice reaction time and in tremor magnitude.
2. Habituation to coffee only showed a similar *decrease* in maximum work output, with corresponding *increase* in reaction time and in tremor magnitude.
3. When habituation to the 400 calorie breakfast was accomplished after the "coffee only" period, a significant *increase* over the findings in the "coffee only" period in maximum work output resulted and both simple and choice reaction time as well as muscle tremor magnitude showed a noteworthy *decrease*.

The authors point out that no direct comparison could be made of the physiologic responses during the 400 calorie and 800 calorie breakfast periods, because the breakfast period of "coffee only" occurred between the 800 calorie and 400 calorie periods.

This controlled investigation now provides experimentally established support for the widely advanced admonition "Eat an Adequate Breakfast." For, though the authors do not draw this conclusion, it may well be reasoned inversely that maximum work output should be increased, and mental acuity improved, when faulty breakfast habits are replaced by the eating of an adequate morning meal.



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1. Grasp hub of needle between thumb and index finger. Insert *AMPIN* needle deep into the muscle selected (preferably the gluteus maximus). *AMPIN* must be in "BOTTOMS UP" position.

2. Flatten rubber tube just above needle hub by pressing firmly with same thumb and index finger and then release pressure quickly.

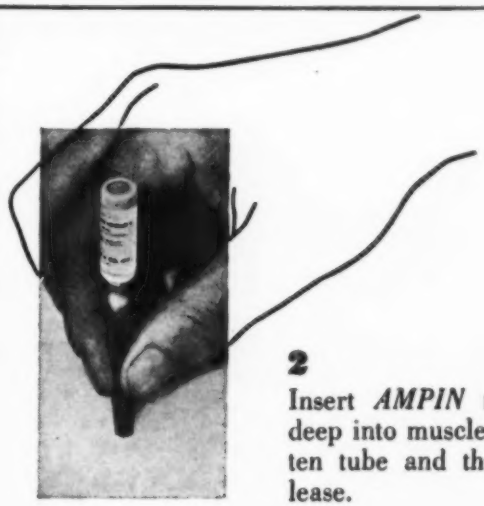
3. If in vein, blood will show in tubing at top of needle hub. In this case flatten tube again to expel blood. Withdraw needle and immediately re-insert at a slight angle to avoid vein and re-aspirate.

4. If no blood appears, slide thumb up to base of ampule bulge and, using index and second finger, snap ampule tip by applying thumb pressure (as if breaking a matchstick with the fingers).

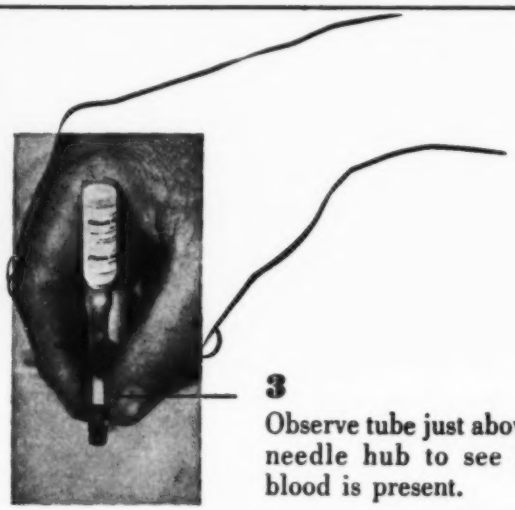
Do not pinch the neck of the ampule. Snap it like a matchstick.

Remember to keep the *AMPIN* in a "bottoms up" position.

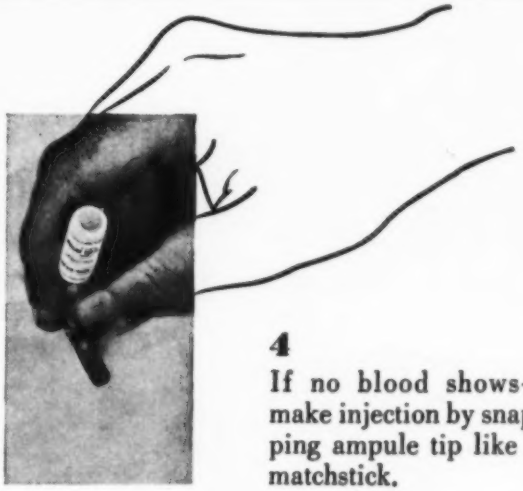
1
After sponging injection site, grasp hub of needle between thumb and index finger. Remove needle cover.



2
Insert *AMPIN* needle deep into muscle. Flatten tube and then release.



3
Observe tube just above needle hub to see if blood is present.



4
If no blood shows—make injection by snapping ampule tip like a matchstick.

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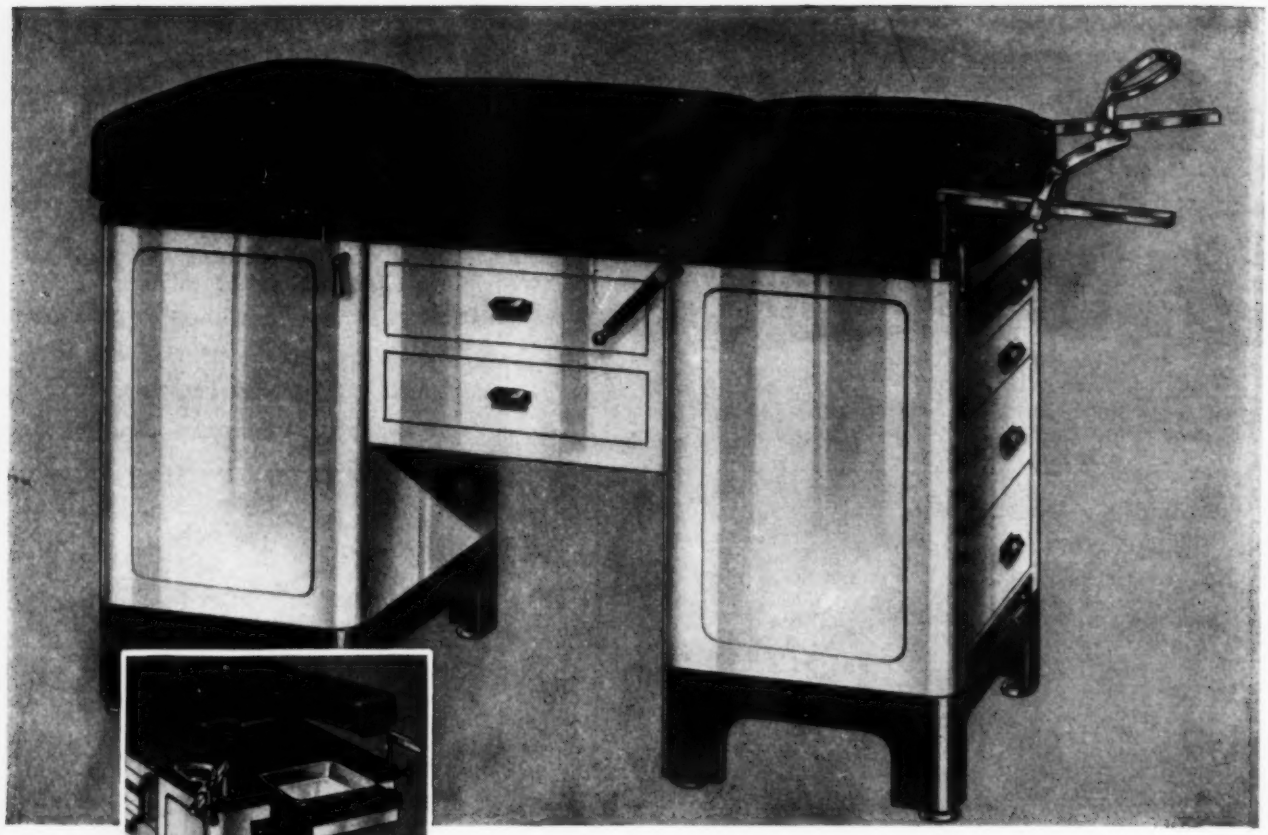

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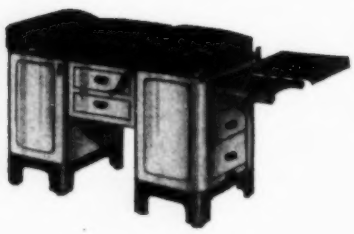

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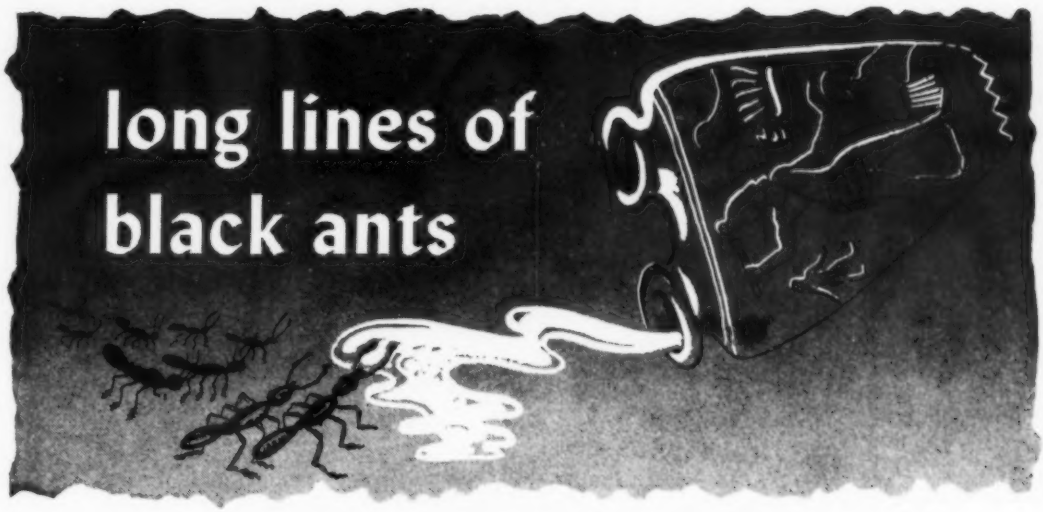

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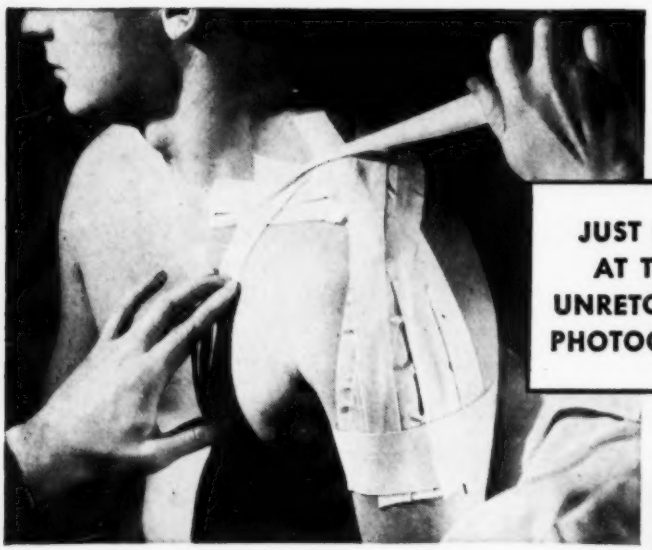

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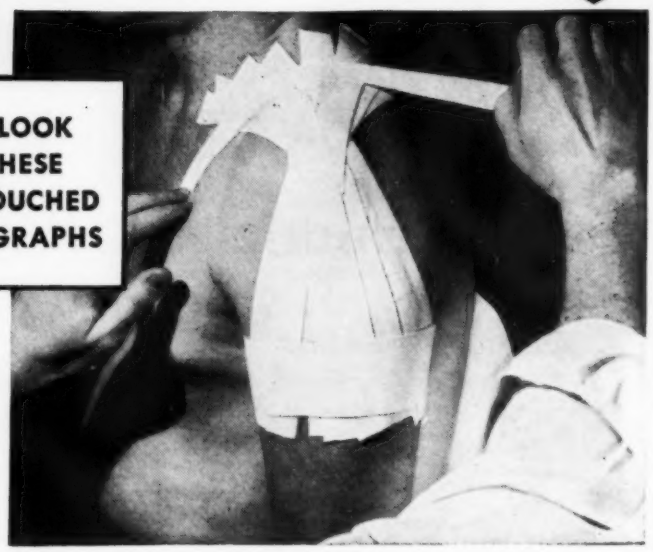

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Laryngoscope, Feb. 1935, Vol. XLV, No. 2, 149-154; Laryngoscope, Jan. 1937, Vol. XLVII, No. 1, 58-60; Proc. Soc. Exp. Biol. and Med., 1934, 32,241; N. Y. State Journ. Med., Vol. 35, 6-1-25, No. 11, 590-592.

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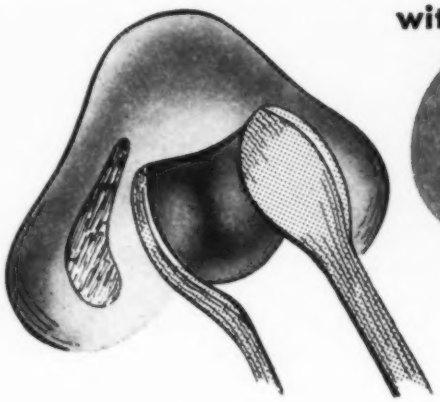

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INDUSTRIAL MEDICINE

Volume 18 JULY 1949 *Number 7*

Ingenious and Unusual Devices for Use in Industrial Medical Departments

Two Time Savers in Testing Applicant's Vision

G. E. KOHLER, M.D.,
Medical Director, Ternstedt Division,
General Motors Corporation,
Trenton, New Jersey

PSEUDO-*Isochromatic Plates Mounted in Frame.* The writer has found it very helpful to have the plates used for testing color vision mounted in a frame on the wall in the examining room, rather than to have them placed in a book or handed to the applicant being examined. This saves time, is always available, and does not need to be touched by the examiner. (Fig. 1.)

DEVICE *for Holding Jaeger Test Types at 14 Inches.* For several years the device pictured in Fig 2 has proved to be useful while testing applicant's near vision.

The Jaeger Test Type for testing vision has been framed under glass. To make certain the proper distance is used between the eyes and the test plate, a metal bar measuring exactly 14 inches over all, with padded headrest has been permanently attached to the top of the frame at right angles to the print. When the headrest is placed against the forehead the proper testing distance is assured. (Fig. 2.)

Four Practical Aids for the Industrial Medical Department

KENNETH D. SMITH, M.D.,
Staff Physician, Cadillac Motor Car Division,
General Motors Corporation,
Detroit, Michigan

THE USE *of the Sam Browne Belt in Chest Injuries.* Among the injuries that confront the industrial surgeon are those of trauma to the chest wall. These may range from simple contusions to severe costal fractures. Irritation and damage to the subadjacent pleura, in a large proportion of these injuries, result in discomfort in the milder cases to marked pain in the severe cases, which may be punctuated by agonizing episodes when the patient coughs or sneezes.

Included in the usual treatment regime of these injuries is the partial immobilization of the chest wall. The commonly used method of accomplishing this by semi-circular strapping with adhesive has too many disadvantages. It is inefficient at best, tending to loosen rapidly. The chest usually must be shaved. Because of its tendency to pull, to cause skin irritation and even bleb formation, it is uncomfortable and often painful. The local application of heat is impracticable. Unless water-proof tape is used the patient cannot bathe. Finally, its removal is an unpleasant ordeal. Any-

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

one who has undergone this treatment in hot weather can attest to these disadvantages!

An effective method of obtaining restriction of rib movements with none of the disadvantages of adhesive strapping is the use of the "Sam Browne" belt. (Fig. 3.) This is a canvas web belt, usually four or six inches wide (depending on the manufacturer), with multiple small straps on one end and buckles on the other to facilitate its adjustment. One or two adjustable shoulder straps insure its proper height on the chest and prevent its slipping downward.

With this belt one can accomplish complete circular strapping of the chest, adjusting its tightness to give maximum relief. No shaving of the chest is necessary. Its use is attended by no skin irritation. It may be removed for the application of heat, to use local anodynes, or for bathing.

Use of this belt over a period of years has definitely proved its value in cases requiring immobilization of the chest, be they contusions, fractures, or pleurisy. It is our practice to stock the appliance in various sizes and, as the need arises, to lend it to the patient. When he no longer has use for it, it is returned. It is then laundered and is ready for the next patient.

Specifications and sources of supply will be furnished by the writer on request.

Removing Casts

THE USE *of the Gigli Saw in Removing Casts.* The usual methods of removing casts are time-consuming. To the busy industrial surgeon, any improvement on the technique which shortens the time, simplifies the procedure, and requires no expensive equipment, is a welcome addition to his armamentarium. We have used such a procedure for a long time and have found it most satisfactory.

The only equipment necessary consists of rubber tubing about one-fourth inch in diameter, a Gigli saw blade and handles for it. The procedure is carried out as follows, preliminary steps being taken before the cast is put on: After the padding of sheet wadding has been applied to the affected part, the tubing is placed on the sheet wadding along the line where the cast is to be cut for removal. The tubing should not be too soft, else application of the plaster may compress it and result in difficulty in passing the Gigli blade through it when the cast is to be removed. The tubing is secured by a few strips of adhesive tape and the cast is then applied in the usual manner. It is necessary, of course, that the tubing protrude from each end of the cast a short distance. (Fig. 4.) When the cast is to be removed, the Gigli saw blade is passed through the tubing and the handles are attached. The sawing strokes should be parallel to the cast for otherwise the blade may kink when bent sharply and occasionally break. The cast is then spread in the usual manner and removed. When it is desired to bivalve a cast, two tubes are used.

Rubber Mat

THE USE *of a Rubber Mat to Facilitate Physical Examinations.* A simple yet valuable aid in doing routine physical examinations is a small black rubber mat, 14 by 18 inches, placed where the examiner wishes the patient to stand. (Fig. 5.) When the patient enters the room he is told to stand on the mat, thus eliminating any tendencies he might have to sit on a convenient chair, wander about the room, or lean over the examiner's desk. In short, the patient remains fixed on one spot, saving time and unnecessary instructions. Another advantage is that the mat can easily and often be cleaned. Several may be used if group examinations are to be done. In our experience we have found that this useful little adjunct has been of great assistance in streamlining our examination routine.

Fig. 5.

Eye Dropper Container

A PRACTICAL *Eye Dropper Container.* Persons with ocular complaints comprise a large proportion of the patients reporting to the industrial hospital. To care for them properly an adequate supply of sterile eye droppers must be constantly at hand. Many methods are employed to accomplish this end.

The use of an eye dropper container, parts of which can be purchased cheaply and the remainder easily constructed, has proved to be the answer to this problem. This piece of equipment consists of a container with a lid, within which is placed a rack which holds slightly less than 100 eye droppers. The container, easily available at any hardware or department store, is a white enamel kettle approximately eight inches in diameter and five inches deep. Two side-handles make it easy to carry. A well-fitting lid, also with a handle, completes the container. The rack has a circular base slightly smaller than the inside diameter of the bottom of the kettle upon which it rests. The top of the rack is also circular and is supported on and attached to the base by four legs approximately three inches long which are evenly spaced on its periphery. Holes are bored in the top, the diameter of these being slightly larger than the glass stems of the droppers but slightly smaller than the rubber bulbs. These permit the glass stems to hang below the top, the droppers being supported on it by the rubber bulbs. (Fig. 6.)

The advantages of this container are obvious. It is easily cleaned, autoclaved, and transported, and a large number of sterile droppers are always at hand.

Fig. 6.

Two Simple Devices for Use in Industrial Surgical Departments

ETHEL LYLE, R.N., and HANS F. KIPPING, M.D.,
Chevrolet Motor Division,
General Motors Corporation,
Tonowanda, New York

A SIMPLE *Instrument for Cleansing Wounds.* In our plant there has been difficulty in cleansing superficial wounds due to contact with grinding wheel dust and grey iron, the latter always leaving a very soiled wound after the lightest contact. A simple device was conceived for soft-scrubbing these wounds. A medium-hard ordinary tooth brush (Fig. 7), obtainable from the usual sources, is stored in its original glass container or test-tube with the usual gauze and oil silk cover for the opening, permitting autoclaving. A supply of eight or 10 such brushes

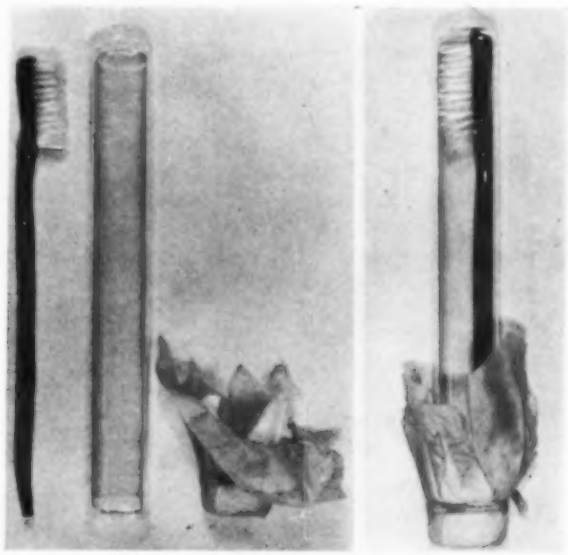

Fig. 7.

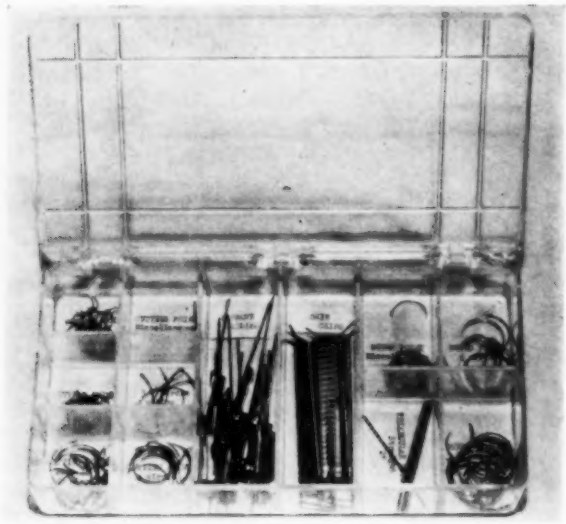

Fig. 8.

may be kept on hand for instant use. One disadvantage of the plastic handle is that it tends to warp and become distorted when subjected to autoclave temperature. This does not substract from its usefulness.

TWO PLASTIC *Boxes for Storing Surgical and Hypodermic Needles.* A compartmental box for storing suture needles can be devised, without alteration, from a conventional fishing tackle box available at any sporting goods store or gadget department of a department store. A box 8¼ in. x 4½ in. x 1¼ in. made of transparent plastic with a snap-on lid, hinging on the long side, divided into 12 compartments, has proved very suitable for the storage of suture needles. By affixing labels on the bottom of each compartment (these labels are readily visible through the bottom of the box) a hasty identification of the contents of each section can be made permitting easy inventory and good housekeeping. In Fig. 8 one of the two central long sections contains Petroff needles, while the other contains Michel's skin clips.

A similar box of the same size divided into seven compartments and similarly labeled permits visible storage of hypodermic and syringe needles. (Fig. 9.)

The total cost of these two boxes was $1.79 including local sales tax. Larger or smaller boxes may be obtained to suit individual needs.

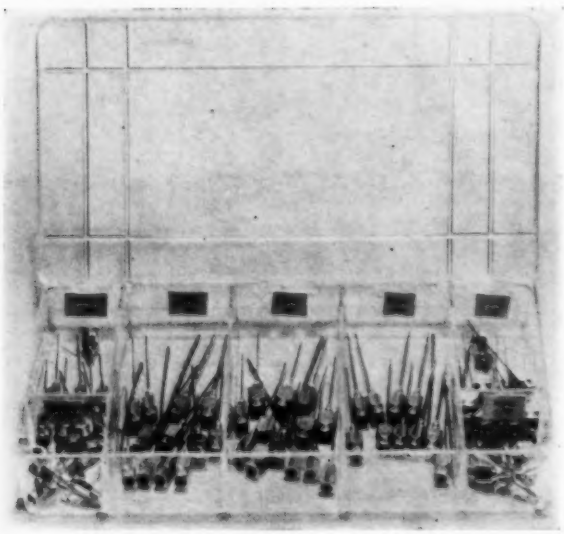

Fig. 9.

Dispenser for Semi-Solid Cleanser

WILLIAM E. BONES, M.D.,
Medical Director,
Buick-Oldsmobile-Pontiac Assembly Division,
General Motors Corporation,
South Gate, California

ABSTRACT by EARL F. LUTZ, M.D.: Automobile body workers of the Buick-Oldsmobile-Pontiac Assembly Division frequently soiled their hands with a cement (rubber dough) used for glueing rubber trim into automobile bodies. The usual agent for removal of the rubber dough was very apt to cause a defatting dermatitis. A semi-solid gelatinous cleanser was found which was effective in removing this cement from the worker's hands without this objection. However, it was rather messy to dispense, and a considerable quantity was wasted. DR. WILLIAM E. BONES demonstrated a dispenser which proved to be practical and efficient for discharging a specific quantity of this gelatinous cleanser. It aroused a great deal of interest among the industrial physicians at the Detroit Conference. Details concerning the dispenser can be procured by communicating directly with DR. BONES at the above address.

Method of Reproducing Prints of X-Ray Films

F. J. BARKMAN, M.D.,
Medical Director, Fisher Body Division,
General Motors Corporation,
Hamilton, Ohio

IN THE practice of present-day industrial medicine, it is frequently necessary to forward reports of industrial accidents and their progress to other concerned parties. Occasionally, one wishes to have a copy of any x-rays taken supplement such reports, but at the same time is desirous of retaining the original film in the doctor's personal file. The following is a description of a simple practical method used by the writer for making prints of x-rays in those cases where it is desired to furnish detailed description of injuries.

A 10 x 12 piece of single-strength glass with edges bound with scotch tape to prevent injury to the technician is attached at one end by tape

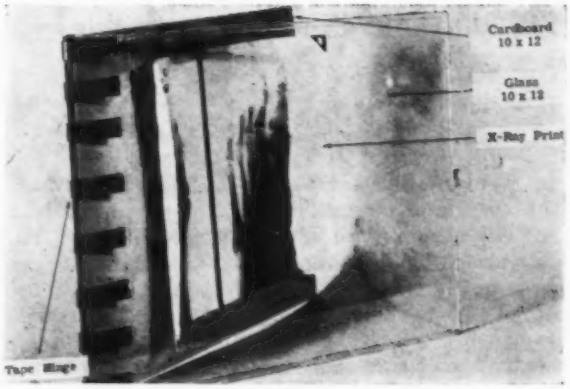

Fig. 10.

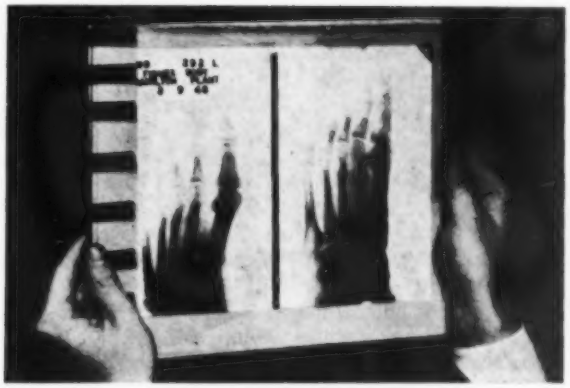

Fig. 11.

to a piece of cardboard of similar size. The tape acts as a hinge. (Fig. 10.) This device is equivalent to the conventional photographic contact printing frame. In use, a sheet of suitable photographic paper and the radiographs are placed between the glass and the cardboard with the radiographs over the emulsion side of the paper. (Fig. 11.) A brief exposure to light is then made. The time required is determined experimentally. The paper is then processed in the same manner as the original radiograph. However, the x-ray film requires three and one-half to four and one-half minutes to develop, while the print is much faster, requiring only a few seconds. This must be watched and the process stopped when the print is visible.

A Small Dermatone for Accurate Split-Thickness Grafts

OTTO J. PRESTON, M.D.,
Medical Director, Chevrolet Motor Division,
General Motors Corporation,
Flint, Michigan

DR. PRESTON demonstrated a small dermatone for accurate split-thickness skin grafts. It is anticipated that a complete description of the dermatone will be published in one of the leading medical journals within the next few months.

[NOTE: The foregoing article (pp. 263-267) was a feature of the meeting of the "Section on General Manufacturing" at the A.A.I.P. & S. Conference at Detroit, April 5, 1949.]

Bloomingdale's New Health Center for Employees

COMPRISING 15 air-conditioned examination, treatment and rest rooms, the new Health Center for approximately 4,000 employees of Bloomingdale Brothers, Inc., New York City, was recently inaugurated, with New York City Commissioner of Hospitals DR. MARCUS KOGEL as honored guest. The formal opening of the new enlarged, and completely modernized, Center on the seventh floor of the New York Department store was dedicated February 11 to the memory of the late LYMAN G. BLOOMINGDALE. Occupying 3,000 square feet of space, the unit includes a reception room, service and record department, an eye examination room, two examination rooms for new applicants for employment, the Medical Director's office, two nurses' treatment rooms, a consultation room, a laboratory, a physiotherapy room, a complete x-ray unit, and three rest rooms. Pre-placement examinations and treatments will be facilitated by the use of laboratory and x-ray facilities, formerly unavailable within the store. Physiotherapy facilities include short wave, infra-red, ultra-violet and water therapy. Additional diagnostic equipment will include an electrocardiograph, basal metabolism tester and apparatus for special visual and hearing tests. DR. NATHAN MILLMAN is the Medical Director.

—*Health on the Job*, May, 1949.

Are Annual Physical Examinations in the Automobile Industry Desirable?

W. A. DAWSON, M.D.,
Physician-in-charge, Ford Motor Company,
Rouge Plant, Detroit

WITHOUT a doubt the answer is "Yes." From an ideological point of view, annual physical examinations *are* desirable. However, if this word "desirable" had been changed to "practical" the subject would certainly be more controversial.

Much has been said about the desirability of annual physical examinations in industry. It has been pointed out that this procedure detects the onset of disabling disease in its incipient stage when it is more easily corrected. But this necessitates handling so many normal people to find a small percentage of pathology that, with a limited medical budget, it is usually impossible.

Let us consider a plant with a population of 10,000. According to currently accepted standards a plant this size would employ two full-time physicians. If they were to do annual physicals on all employees, allowing only 15 minutes per examination, it would require more than two-thirds of the time of both for the entire year, or full-time for one of them and two-fifths of the time of the other to complete the 10,000 examinations. These figures allow only time off for lunch. They do not take into consideration vacations or any hitch in the flow of employees. Also, the services of stenographers, laboratory technicians, x-ray technicians, file clerks, etc., would be required.

Consequently annual physical examinations cannot be accomplished with existing medical personnel without gross neglect of the many other duties of the medical department.

In this age of anxiety, hard-hitting competition and consequently limited medical budgets, it is doubtful if management would approve any proposed budget increase to cover the additional personnel necessary to make adequate annual physical examinations possible.

It is admitted that a healthy employee is a more productive employee, and that the basic reason for a modern medical department is to achieve a maximum of employee-health at a reasonable cost. In other words, we must "compromise the ideal with the practical" or, as our prominent confrere DR. C. O. SAPPINGTON has rather elegantly said, "The truth is that medical and health service in industry is a compromise between the ideals and humanitarian objectives of the practice of medicine and hygiene on the one hand and the exigencies of industrial and commercial competition on the other."

IT IS the purpose of this talk, therefore, to outline a practical substitute for annual mass examinations of *every* employee and concentrate on those employees where medical services should be more effective.

This can be accomplished by regularly scheduled periodic examinations on approximately four selected groups such as:

1. Those employees having the more hazardous occupations. Of course, the time interval depends upon the nature and intensity of the exposure. These periodic examinations need not be a complete physical; a partial examination is often sufficient. For example, employees working in a dusty environment should have chest x-rays every one or two years. Those working continually with solvents, especially of the benzene family, should have a blood count every three months. Degreasing operators should have a urine examination at least annually. The senile or aged should be examined annually to check their job with their physical ability. Geiger-Mueller counts should be performed every two to six months on employees with radioactive exposures, such as x-ray technicians and employees working with the new radioactive isotopes that are now being ning to be used in industry.
2. Chronic absentees.
3. The aged.
4. Special examinations.

Presented at the meeting of the "Section on General Manufacturing," at the Thirty-Fourth Annual Meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, Detroit, April 5, 1949.

Effects of Electricity on the Human Body

W. B. KOUWENHOVEN,
Dean, The School of Engineering,
Johns Hopkins University,
Baltimore, Maryland

ONE of the effects of electricity on the human body is death. This phenomenon, a result of lightning, has existed since the time of creation. The first reported death due to man-made electricity occurred in France in 1879. Today in the United States and Canada the death rate due to electricity is seven per million of population. In determining the effects of electricity on the body, we must consider not only the type and voltage of the circuit, the resistance offered by the body, and the value of the current that flows, but also the pathway of the electricity through the body, and the duration of the contact. The type and voltage of the circuit with which contact is made have pronounced effect upon the resulting injury. Low voltage alternate current circuits are much more dangerous than direct current circuits of the same voltage. Very high frequency circuits have little or no effect except heating.

The resistance offered by the body to flow of current consists of two parts: that offered by the skin at the points of contact, and that offered by the tissues. Dry skin is an excellent insulator, and, when it becomes thoroughly moistened, it loses its insulating properties. The skin itself may be considered as a capacitor with a poor dielectric. The resistance of the tissues once the current gets inside the body is practically a pure resistance.

The values of the current that flows through the body are of prime importance as to a large extent they determine the resulting injury. Among the current values that are of interest are:

1. Threshold of feeling.
2. Let-go current.
3. The current that will produce ventricular fibrillation.
4. The current that will produce a block in the nervous system.
5. The counter shock current.

Small currents of the order of one milliampere will produce a slight tingling sensation. As the current value increases, there will be a contraction of the muscles and this contraction may be so severe as to prevent the victim freeing himself from the circuit. The let-go current is that value of current which an individual can withstand without harmful effects for the length of time required for him to voluntarily release his hold on the circuit. For men the commercial frequency let-go current is nine milliamperes and for women, six. If the current exceeds these limits, it may hold the individual to the circuit and prevent him from releasing himself. Such currents are very dangerous because, unless there is someone present to break the circuit, the skin may be blistered and lose its protective resistance. A current of one-tenth of an ampere flowing from the hands to the feet is sufficient to throw the ventricles of the heart into fibrillation. Under these conditions the circulation ceases and death will ensue. A block or partial paralysis may be produced by a current of one or more amperes. This block prevents the signal from the brain reaching the various organs, and, if the lungs are affected, respiration stops. In such cases artificial respiration should be promptly applied and continued until nature has a chance to repair the damage and natural breathing is reestablished. The path that the current follows in its passage through the body determines to a large extent the resulting injury. If there are no vital organs in this path, there are usually no injuries (except possible burns). In most industrial accidents the path is from the hands to the feet.

Passage of electric currents through the body has different effects that differ in intensity. They vary from healing effects to death. The results depend upon the voltage, the frequency, the path of the current, and the duration of the shock. Some of the effects are muscular contraction, convulsions, narcosis, loss of consciousness, burns, emission, increased blood pressure, hemorrhages, nerve block, damages to the nervous system, and ventricular fibrillation. Permanent effects fortunately are rare, and most victims of electric shock either recover completely or die. Death from electric shock may result from a number of causes or from a combination of two or more. In general, low voltages are believed to kill through the mechanism of ventricular fibrillation, and high voltage circuits either through destruction or inhibition of the nerve centers.

Presented at the meeting of the "Section on General Manufacturing," at the Thirty-Fourth Annual Meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, Detroit, April 5, 1949.

Industrial Medical Potentials
—A Time and Job Analysis of Medicine in Industry—

WILLIAM J. FULTON, M.D.,
Medical Director, Central Office,
General Motors Corporation,
Detroit

THE SUBJECT first assigned to me for this meeting was "The Economics of Industrial Health," and, finally, "Industrial Medical Potentials." The definitions of the two words "economics" and "potentials" are sufficiently broad to allow great latitude. As to "economics," I choose to use it as the planning of the means and methods of living well and satisfying man's needs. Economic planning entails the exercise of prudent foresight. "Potentials" indicate possibilities only, and possibilities are infinite. Potential possibilities are likewise stationary and will remain so until transformed into kinetic action. The potentials of atomic energy have always existed. The potentials of penicillin have been eternally present in the dirt of our own back yards and in the jam pots on our pantry shelves. Hence, to enumerate the potentials of Industrial Medicine would be to begin at the beginning, pass through the great advances of the past quarter century, and continue into a nebulous maze of theoretical assumptions. A number of what were once potentials are now kinetic realities of Industrial Medicine and subjects for discussion on the agenda of this gathering.

With the hope of making a constructive contribution toward prudent planning, I would like to discuss some of the basic things that I believe will make more secure the advances thus far made, and be the means of bringing into reality many still dormant potentialities of Industrial Medicine.

To be successful, any plan must get down to the grass roots of the problem, and must bring together those who do the actual day-to-day work and those who are directly responsible for it. Hence, not only the full-time industrial physicians should plan, but also that right arm of the profession, the full-time industrial nurse, has planning potentials of equal importance. Included also should be the industrial hygienists, the safety engineers, personnel administrators, and others engaged in human relations activities. My 14 years of experience in Industrial Medicine have unfolded before me a gigantic panorama of human relations, of which physical medicine forms but a minor portion of the scene. Medicine standing alone in industry is not self-sufficient. While it may and should take the lead, it nevertheless needs the cooperative help of, and can give valuable cooperative help to, those other agencies.

My experience with a cross-section of the adult population over these years also leaves me with a near conviction that perhaps the whole political future of medicine may depend more upon good human relations than upon excellence in the specific art.

WE INTEND to begin at the grass roots of Industrial Health Administration—at the basic fundamentals, the every-day experience familiar to every full-time physician and nurse. We will not paint the picture as we would like it to be, but as it actually is. We will not plan for our patients, but will consider what our patients wish us to plan. What are the desires, complaints, and demands of people at work, and what is the character, rate, volume, and distribution of those desires, complaints, and demands? To fulfill them satisfactorily, what must medicine do, and what does it need?

We believe in building our plan from the bottom up rather than downward from the rare and sensational. Much of the professional time consumed in repeated surveys of the whole haystack to find the occasional and usually specific pathological needle can be saved through consistent quality attention to the every-day complaints of our fellow men at work. There is nothing new in this belief. A fair number of rare pathologies, and most certainly a greater variety, have been uncovered through this simple medium. As to the quality of the human relations involved in satisfying the desires of the people, the ministrations of 10 of those general practitioners affectionately known as "family doctors" are worth a thousand impersonal specialties, plans, or surveys.

The departments in industry chiefly concerned with human relations are the personnel, medical, and safety departments. All have an identical goal; namely, the improvement of human relations through the advancement of happiness, health, and safety. As a team, I have sometimes referred to them as "The Three Musketeers of Human Relations." In contrast to those that manufacture material products, these three departments require scant material and very few tools. Their chief tool is TIME: time for a good grade of personal individual contact; time for a good grade of follow-up. The quality of their product, the improvement in their techniques, the advancement in their value, all hinge critically upon this principal tool—TIME. Long-term observation is most convincing that the degree

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of efficiency and the dollar value of these departments is directly proportionate to the local per capita time at their disposal, and that this hypothesis is capable of tangible proof.

For too long the production of good human relations has been dealt with in vague generalities and plausible-sounding theories. It is our intention to turn the microscope of detailed analysis on some of these generalities, particularly as they apply to the practical every-day administration of medicine within industry. From this analysis will evolve some very basic and fundamental principles that must be taken into account before there can be prudent planning, dependable evaluation of medical services, or a reliable standard for insuring efficient administration.

TO DATE, medical services in industry have been appraised almost solely on cost. Despite the numerous functions added to the itinerary in the two past decades, there has been little change in methods or standards of appraisal. It is high time that we pause to take an inventory, and to appraise medical services in terms of *Time* and *Quality* rather than in terms of *Cost* and *Quantity*.

The data and observations presented here represent only the summary highlights of extensive and detailed studies covering more than 12 years. The data are confined to MANUFACTURING industry and much of it has been correlated with other comparable data and experience.

Let us first examine the initial reason why medicine in industry is good business. (Table 1.) In manufacturing industry, the average per capita rate of on-the-job injury is seven per year; the average per capita rate for retreatment of injury is five per year. Using the modest figure of $3.00 for the first visit and report, and $2.00 for a revisit, you have a potential per capita cost of $31.00 per employee per year. Note the potential cost opposite the varying numbers of employees in the two columns. Place a competent registered industrial nurse in your establishment and your potential cost will be cut by more than half. Will a nurse pay her way in a group as small as 200? Compare the potential costs to the salaries of industrial nurses. Remember, a nurse's potential value goes far beyond the mere care of compensable injury. You employers who do not have an established in-plant medical or nursing service, divide your annual compensation premium by your average number of employees, and compare results with this $31.00. You who do have an established medical or nursing service, do the same. You will probably be well below $31.00. The establishment of such service by its mere presence will reduce your premium from 40 to 60%. When we consider the potential costs in the one to two thousand groups, the subject of very small plants comes to mind and it is a most important problem. It would seem that groups as small as 10, which, in a three-mile radius would aggregate a total of 1500, would easily justify in potential savings the establishment of a medical service. The potential cost for compensable injury alone would support an extensive program that would well extend into the industrial hygiene phases, the maintenance of good health, and progressive research. In an excellent survey of Industrial Health Department Functions and Relationships, made by DR. C. O. SAPPINGTON for the Industrial Hygiene Foundation of Pittsburgh, just published, it is noted that the per capita costs of operating very extensive medical programs in a group of 133 plants, covering more than 575,000 employees, will average less than $15.00. Yes, medicine in industry is very good business.

TABLE 1.
POTENTIAL COST OF COMPENSABLE INJURY
MANUFACTURING INDUSTRY

Annual Per Capita Rate		Minimum Cost Outside Service
7 New Injuries	@ $3.00 first visit	$21.00
5 Retreatments	@ $2.00 visit	$10.00
Annual Potential Per Capita Cost		$31.00

Number of Employees	Potential Cost Outside Service
100	$ 3,100.00
200	6,200.00
300	9,300.00
400	12,400.00
500	15,500.00
1000	31,000.00
2000	62,000.00

Now to analyze medicine's every-day job in industry. If we but take a page from industry's book and use it, we will find that the principles of Job Analysis and Evaluation, Time and Motion Study, the Flow Chart, and Quality and Production Standards can all be applied to our own jobs. We also will find that the results of our application will come out in terms and language quite understandable to management. Through the application of these principles, we have found that the jobs performed by medicine can be broken down and grouped into two main classifications.

One, here designated as Direct Service (Table 2) is more constant and predictable; the other, Indirect Service, is more intangible and variable.

TABLE 2.
INDUSTRIAL MEDICINE
DIRECT SERVICE, MANUFACTURING INDUSTRY

The immediate, on the job care, treatment, recording, and disposition of the following types of cases:	
1. New Injuries—minor and serious	45%
2. Redressing or Retreatment of all Injuries	25%
3. Medical Complaints—minor and serious	26%
4. Checking Returning, sick or injured Absentees, as to fitness to work safely, etc.	4%
	100%

The following types of cases, services, or functions fall within the classification of Direct Service:

The immediate, on-the-job care, treatment, recording, and disposition of the following types of cases:

1. *New Injuries* minor and serious 45%
2. *Redressing or retreatment of all injuries* 25%
3. *Medical Complaints*—minor and serious 26%
4. *Checking returning*, sick or injured *absentees*, as to fitness to work safely, etc. 4%

100%

The proportions, shown on the right as percentage, represent an average day's work.

Let us enumerate and discuss some of the highlights of Direct Service.

1. Cannot be avoided. Establish a medical room of any size or description that is accessible to people at work, and those people will produce the demand for the first three. To attempt to control this too drastically is a short-sighted policy. As to the fourth, supervision having any degree of human interest in the employees will create the demand for this service.

2. Direct services form an uninterrupted flow throughout the entire working span. Even though the number of people remains constant, they will nevertheless produce wide variations in the daily and hourly number of contacts. Medical staffing to meet these peaks must be flexible. Service must be immediate and complete within the working hours.

3. An eight-hour work shift requires a span of nine hours of medical coverage.

4. These services are the FIRST on the list to be performed. They must be completed before other services and duties can be undertaken effectively.

5. From 1% to 1.5% of these cases will be emergencies, varying from death to cases requiring contact with private physicians and transportation to hospital or home. They require undivided medical attention and time, amounting to never less than 30 minutes.

6. In number, these services form the bulk of medical contacts. Repeated analyses of records and observations of Direct Service cases over a period of years result in the same general round-figure conclusions shown here. (Table 3.) From 80 to 85% of visits for injury or medical complaint are produced by 30% of the people. From 60 to 70% of the individual minor "sick" absences (less than eight days) are produced by 20% of the people. With few exceptions, the same individuals remain in these groups year after year. Comparison of the physical condition of the people in these groups discounts the theory that physical condition is a criterion of performance.

When those in the 30% group are studied over a period of years, we find that, while the incidence of true physical ills and disabilities that are amenable to modern medical treatment is no higher than in the total population, within this group are found the *preponderance* of neurotics, indigents, and otherwise below par individuals; the accident prone or those with a high ability to hurt themselves and frequently involve others; those whose life span is more prone to be shortened through accident or violence; those who produce the majority of all the headaches and problems of human relations, and those who shout, kick, and threaten the loudest for more of everything. We do not intend to convey the impression that every individual who happens to fall within the 30% group is in the above categories, nor that all within those categories are to be found in the 30% group. We do, however, intend to point out that the human factor, not the health factor, is the underlying cause of most accidents, complaints and personnel problems.

In view of the fact that 85% of direct services are produced by a consistent 30% of the people, it should be pointed out that medical services limited *narrowly* to this classification will be operating to the almost complete medical neglect of 70% of industrial society. Very little prevention or profit and extremely limited progress lie within this type of NEGATIVE MEDICINE.

Do those within the 30% group represent subnormal humanity? Who am I to say? When identified, should this segment be eliminated? Of course not! After all, there is nothing new about the problems posed by subnormal humanity. They have been with us since the beginning of time and shall remain until, perhaps, the millenium brings an Utopia of hereditary perfection. Nor are the problems of dealing with this segment unique to industry. They are national problems. We are only recording our observations for what they may be worth—observations that, at least to me, manifest the existence of a collective

TABLE 3.
ANALYSIS OF RECORDS AND OBSERVATIONS

Accidental Injuries and Medical Complaints	
80 to 85%	are produced by 30% of the employees
15 to 20%	are produced by 60% of the employees
0 to 5%	are produced by 10% of the employees
Individual Minor "Sick" Absences	
60 to 70%	are produced by 20% of the employees

The percentages remain constant.

The individuals within the percentage groups (with few exceptions) remain the same individuals regardless of environment.

Physical condition is no criterion of performance.

The majority of all problems arise in the 30% group.

The human factors—not the physical—play the important role in accidents, degree of efficiency, and human relations.

TABLE 4.
COMPARISON OF EMPLOYEES ON IDENTICAL OPERATIONS
RECORD FOR ONE YEAR

	Accidental Injuries	Sick Complaints	Individual Sick Absences	Total	Severe Injury	Psychiatric Note on Original Examination
1	27	14	4	45	Yes	Yes
2	23	31	15	69	Yes	Yes
3	19	4	2	25	No	No
4	14	3	1	18	No	No
5	13	7	1	21	No	No
6	12	2	3	17	No	No
7	10	12	10	32	No	No
8	10	5	11	26	No	No
9	10	3	4	17	No	No
10	5	3	3	11	No	No
11	4	2	1	7	No	No
12	4	0	2	6	No	No
13	2	2	0	4	No	No
14	0	2	1	3	No	No
	10.93	6.43	4.14	21.5	Per Capita	
14	153	90	58	301	Total	

pathology of human relations both macro- and microscopic, the symptoms of which run from accidents to unsound thought and actions. Likewise, the foci of infection of this collective pathology can frequently be traced to individuals and groups of individuals. There is much unexplored territory in this land of collective pathology, and much treasure in etiology, cure and prevention lies buried there. Ours is the opportunity to explore it, and investment in this type of research will pay big dividends to the whole of industrial society.

To illustrate what we mean by (a) the 30% group; (b) accident prone persons; and (c) the human or personality factor, we present an analysis of 14 employees engaged in the same operation. They are arranged in order of the number of accidental injuries they have received over an equal period of time. (Table 4.)

(a) The five having the highest total of all medical contacts, and that would fall within this basic 30% group, have produced 66% of the total contacts for all 14.

(b) Because of the comparative accident record of the first four, they would be classified as accident prone persons.

(c) Within the above four, the first two consistently leading the pack in accidental injuries and sick complaints have not only suffered severe disabling injury, but also carry a personality or "human factor" note on their original pre-employment examination. The word "psychiatric" in the right column is used broadly in this particular survey.

It is also to be noted that the second, seventh and eighth employees have produced 36 of the total of 58 absences. Hence, in this group three employees, or 21%, have produced 62% of the individual "sick absences." Here are your absent prone people.

Cooperation of safety with medicine in putting to work the fruits of research such as these is the potential that will produce the next significant drop in the severity and frequency of industrial accidents.

7. In *manufacturing* industry, people who have free access to an established medical dispensary will produce one Direct Service visit per shift for each 15 people working. This is an *annual* daily or shift average. We noted this 1:15 ratio in 1937 while casting about for some reasonably reliable formula for forecasting the potential number of cases varying numbers of employees would produce. By 1943 its consistency and parallel correlation with other medical directors were sufficient to warrant publication. (Table 5.) The data presented here represent a number of different types of manufacture, covering peace and war; five-day, 40-hour single shift weeks, and six-day 48-hour multiple shift weeks; and all male as well as mixed sex employees. Within the past 50 days an industrial physician in a large manufacturing industry told me that an analysis of his last six months (to November, 1948) showed that this ratio varied between 14.7 and 15.2.

How accurate is this 1:15 per shift rate factor in small groups? The 14 employees whose record was presented in Table 4 produced in one year,

TABLE 5.
RATIO OF ONE DIRECT SERVICE CASE PER SHIFT

1937—14.74
1938—15.19
1939—14.76
1940—15.47
1941—14.70—Highest
1942—15.05
1943—15.85—Lowest
1944—15.11

To the Number of Employees At Work

Variation
Above—2.0%
1:15
Below—5.7%

consisting of 310 working days, the following visits to the medical department:

New accidental injuries	153
Sick complaints	90
Individual "sick" absences	58
	301

This is a rate of 1:13.5 per shift. The revisits for redressing or retreatment of injuries were *not* included. The per capita redressing rate for the 4,058 employees working that year was 6.9. We feel reasonably safe in assigning this rate to these 14 employees, which would amount to an additional 96 visits. This brings the total to 397. This amounts to a rate of one direct service case per shift for each 10.9 employees working.

Such a very high rate can be explained by the vagaries of chance that placed in this small group two individuals (14%) with recorded psychoneurotic tendencies. In the total of 4,058 working, the number having such a record was less than 4%. Had there been a higher proportion of individuals with records similar to the last five, the rate no doubt would have been considerably lower than 1:15. The specific data on which this research is based cover groups from 400 to 6000. The 1:15 ratio correlates favorably with other manufacturing groups up to 70,000.

Challenge of this 1:15 rate factor is welcomed. However, the closeness of your findings to 1:15 will depend upon having a record of *every medical contact* and an accurate count of *all the people* who have access to your department. Too many departments fail to record medical complaints, or limit their records to hourly-rated employees to the exclusion of salaried employees and supervision. Salaried employees produce as many, if not more, medical complaints and absences, than hourly rated employees. It should also be pointed out that *every medical contact takes up medical time* regardless of its character or the individual who makes it.

Why is this 1:15 rate factor so consistent? It does not correlate with plant health or national health. In contrast to 1938 (1:15.19) and 1942 (1:15.05) both of which were relatively *healthy* years, the ratio of 1:15.85 for 1943 is the lowest in this group. Yet 1943 had a *higher* general *morbidity rate nationally* and witnessed a definite epidemic of so-called influenza in December. We believe the true reasons for the stability of this factor are to be found in the following summary of a number of analyses.

Fig. 1 is an analysis of the true cause for Direct Service visits to the medical department. All visits are initiated by some type of possible physical complaint, either real, alleged or feigned. The visitors come of their own volition or are referred by supervision, safety, or personnel departments. Every visit requires a medical decision.

A *true* physical cause is found in less than 50% (47.6%). This agrees with a statement

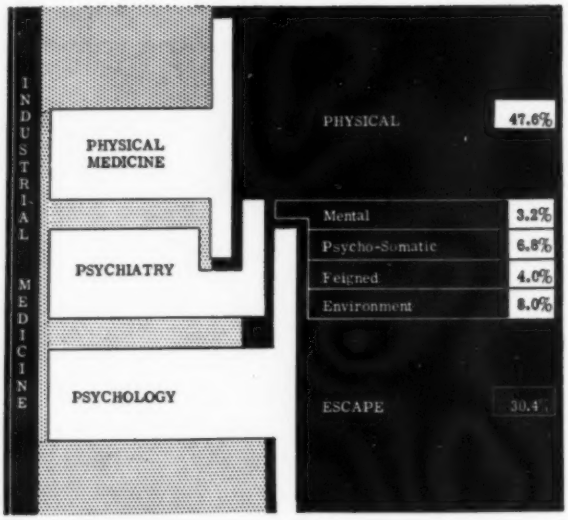


FIG. 1.

that I heard DR. VONACHEN make in addressing a meeting in Detroit last spring. The first three causes listed—Physical, Mental, and Psychosomatic—make up 57.6% of the total. Generally this covers the field for which the average A class medical education furnishes training and equipment. The specialty of Psychiatry overlaps Physical Medicine and will be involved to some extent in the Feigned and Environmental classifications. The total potential involvement is about 22%. The broad term "Psychology" overlaps both Physical Medicine and Psychiatry and is potentially involved in 49.2% of the total. *Escape,* perhaps a vague term, covers those many human causes that furnish the urge "to stop what they happen to be doing and talk to somebody." Any physical excuse will usually furnish a ticket to the neutral zone of the medical department or a non-disciplinary ticket to frequent absenteeism.

It should be noted here that the percentages of Mental and Feigned are relatively high. This series of analyses was made during the late war when a proportion of normal people were siphoned from industry and a higher number of 4Fs and others below standard were employed.

It should be clearly stated that this analysis is not intended to indicate that psychiatrists or psychologists *as specialists* are essential to 22 and 49% of all industrial medical contacts. What we are presenting here is the broad field covered by medicine within industry. Whether we like it or not, any physician stepping into industry must administer his art within this whole field of medical and human relations.

When this study is correlated with the previous analyses highlighting the 30% group, we add strength to our convictions concerning the importance of the human versus the physical factors in the *true* evaluation of health. Here is cause to wonder if the ill health of this nation is not grossly exaggerated. Here is cause to question the bases upon which each and *every*

person is assumed to be entitled every year to 15 days of absence from productive activity because of illness.

If the potential for separating *real* sickness from sickness used *as an excuse*, inherent in this type of analysis, were generally applied, would the results not materially discount many of the accepted conclusions concerning sick absenteeism? We did not raise these questions; they presented themselves in the course of our search for some reason why our 1:15 rate factor remained so constant.

We conclude that the consistency of this factor can be explained on the basis of a constant and sizeable dilution of real physical complaints by an invariable aggregate of universal human relations and reactions.

8. We now come to the *Time Study* of Direct Services. For a number of years, hypothetical questions have been put to foremen, personnel administrators, and executives, with the purpose of getting their estimates of the average medical time involved in the care of these types of cases. A minority replied, "thirty minutes"; the majority, "not less than twenty minutes"; and there was no estimate below "fifteen minutes." Recently one personnel administrator replied, "I would not think much of the value of a visit to the Medical Department that took up less than fifteen minutes of medical time." In view of the human relations implied in the close personal contacts experienced by the Medical Department, this last reply is conservatively reasonable.

We undertook a painstaking stop-watch study of every phase of medical staff activity involved in attending Direct Service cases. (Table 6.) This on-the-job analysis covered a period of years, involved more than 100 medical operations, and required over 10,000 stop-watch determinations. The conclusion reached was that THE AVERAGE MEDICAL STAFF TIME REQUIRED TO COVER A DIRECT SERVICE CASE IS 11.57 MINUTES. This 11.57 minutes represents the *unadulterated* time involved, with no allowances for any reason. This does not include a physician's time. In general, a full-time physician will see about 20% of the Direct Service visitors.

In conjunction with these time studies, a thorough analysis of those operations that could be classified as CLERICAL led to the following conclusion: MEDICAL STAFF TIME INVARIABLY CONSISTS OF 70% TREATMENT (PROFESSIONAL) TIME AND 30% CLERICAL TIME.

Through improved Medical Department layouts, with special consideration to saving time through reducing lost motion on the part of staff members, it might be possible to shave a few seconds off of this 11.57 minutes.

We are unwilling to concede that there is any short cut in time necessary to produce a grade of good human relations, incident to each personal contact, that will insure the ultimate gaining of the respect and confidence of a majority of the patients.

After long experience, research, and analysis, we conclude that an average of 11.57 minutes per DIRECT SERVICE contact is a *minimum* below which the quality of professional and humanic service is open to serious doubt.

TABLE 6.
DIRECT SERVICE TIME STUDY

The average medical staff time required to cover a *direct* service case is 11.57 minutes*	
Distribution of Staff Time:	
Treatment time (professional)	7.20 Minutes
All phases of clerical time	3.47 "
Hospital supply, maintenance, sanitation, etc.	.90 "
Total	11.57 Minutes
Medical staff time invariably consists of 70% treatment (professional) time and 30% clerical time.	

*Physician's time not included.

SO FAR we have presented the highlights of one of the two main classifications of medical services in industry. We have determined two measures or standards—one, the rate factor of 1:15 per shift, and the other, the time factor of 11.57 minutes of staff time per case. Let us put the time factor to work as a tool of management and of the profession—a tool for analysis and appraisal of the quality and potential scope of industrial medical departments. We have long been convinced that this cannot be done on costs alone, and have concluded that THE ONLY WAY to arrive at a valid determination is to BASE OUR APPRAISAL UPON THE NUMBER OF HUMAN BEINGS WHO PASS THROUGH THE DEPARTMENT DOORS WITHIN A DEFINITE PERIOD OF TIME FOR SOME FORM OF MEDICAL SERVICE. To demonstrate the procedure, we present the actual data for a manufacturing industry having an established medical service and an average number of 1,952 employees (Table 7). In this analysis we will shave one-third of a minute from our 11.57 minutes and settle for 11.25 staff minutes per case. The second column contains the total number of contacts, classified as Direct Service, for each month and for the year. The third column shows the number of shifts or operating days for each month and for the year. By dividing the contents of the second column by those of the third, we obtain the average number of cases per shift, as shown in the fourth column. Multiplying the average number of Direct Service cases per shift by our time factor of 11.25 minutes, we determine the average medical staff time requirement per shift for each month and for the year, as shown in the fifth column. We call attention to the breakdown of the average daily staff time requirement for the total year, shown at the bottom. Note that there is a daily average requirement of 7.08 hours of *clerical* work.

In the last column to the right are recorded the various types of physical examinations performed by this department. These are not included in Direct Services and will not play any

TABLE 7.
FIRST SHIFT DATA
AVERAGE NUMBER OF EMPLOYEES 1952

Month	Total Direct Service Cases	Number of Shifts Worked	Average Cases per Shift	Time Computed on 11.25 minutes per Direct Service Case: Staff Time Required Hours Per Shift	Indirect Service Physical Examinations
Jan.	2,646	22	120.2	22.5	261
Feb.	2,789	20	139.4	26.1	44
March	2,891	21	137.6	25.8	46
April	2,423	22	110.1	20.8	289
May	1,974	20	98.7	18.5	312
June	1,853	20	92.6	17.4	62
July	2,114	21	100.7	18.8	16
Sept.	2,311	20	115.5	21.6	182
Oct.	3,405	22	154.8	29.0	233
Nov.	3,360	21	160.0	30.0	99
Dec.	3,268	21	155.6	29.2	74
Total Year	29,034	230	126.2	23.6	1,618

Average Daily Staff Requirement—Year—
Professional (70%) 16.52 hours } Total 23.6 hours
Clerical (30%) 7.08 hours }

TABLE 8.
MONTH OF JANUARY

120×11.25 min. $= 1350$ min.
$2646 \div 22 = 120$
$\frac{1350}{60} = 22.5$ Hours

Direct Service Cases	2,646	
Factory Days Worked	22	
Average Cases per Day	120.2	
Daily Time Required	22.5	Hours GRAPHED

ENTIRE YEAR

Direct Service Cases	29,034	
Factory Days Worked	230	
Average Cases per Day	126.23	
Daily Time Required Standard for the Year	23.61	Hours GRAPHED

part in the analysis that immediately follows.

We are going to graph the data in the fifth column in terms of required time to give *minimum* attention to Direct Services.

As we previously mentioned, these figures *are actual*—not theoretical—and the medical staff serving this specific manufacturing plant consists of two registered nurses. We will designate this plant as DR. SMITH'S. In order to demonstrate the potentials of industrial medicine in terms of "per capita time" or "available staff time," we will parallel our demonstration by staffing this same department with two nurses, one first-aid attendant, and a clerk. Our studies indicate that a staff of this size is necessary to insure *minimum* quality attention to Direct Service to 1952 employees and to allow sufficient flexibility to go beyond this classification and into the realm of prevention and progress. We will call this department DR. JONES'.

The example in Table 8 is presented to demonstrate the method and the simple arithmetic involved in applying the time factor to determine the staff time required for the average daily Direct Service load. The Month of January and the Total Year are selected from the First Shift Data that have just been discussed.

We might well pause here to take a brief look at the time involved in some of those services that are not classified as Direct. (Table 9.) A modest time study of the medical time involved in a minimum pre-employment and periodic physical examination without technical help is presented. The totals are 27 and 25 minutes, including 10 and 8 minutes of physician's time respectively. (Table 10.) An additional 26 minutes will include several basic technical procedures, including chest x-ray. The over-all totals are 53 and 51 minutes.

(Fig. 2.) Side by side are placed identical graphs of the staff time required to care for the average daily Direct Service load each month. The dotted line is the average daily staff time requirement for the entire year. We are plotting an *average*, but bear in mind that in all months there will be frequent peak days well in excess of 30% above those averages. The highest average rate is one case every 3.0 minutes (November), the lowest 1.8 minutes (May), and the year aver-

TABLE 9.
PHYSICAL EXAMINATION FUNCTION

Hospital Time in Minutes	Pre-Employment	Total	Periodic	Total
Clerical				
History-write,up, Record, Instruct, File, etc.			3	3
Placement note to Employment	9			
Schedule Periodic Exams	0		3	
		9		6
Nurses				
Vision test (close & far) Weigh, Measure, Instruct, Record	6		6	
		15		12
Physician				
Inspect write up, etc. Mouth, Throat, Blood Pressure, Auscultation Heart, Lungs (anterior), Hernia, Hemorrhoids, Interview, Record, Placement Recommendation.	10		8	
		25		20
Review past record, Health Maintenance advice, etc.	2			
Rating, Recording, etc.			5	
		27		25

TABLE 10.
PHYSICAL EXAMINATION FUNCTION

	Pre-Employment	Total	Periodic	Total
Technicians				
Urinalysis				
Reaction, Spc. Grav.,				
Sugar Albumin. Record.	5		5	
		32		30
Wassermann				
Sterilize, Draw, Transfer,				
Lab. and Local Record.	6		6	
		38		36
Chest X-Ray				
14 x 17. Complete process				
to follow up and record.	15		15	
Combined Total in Minutes		53		51

age rate is 3.8 minutes.

On the right is a picture of Dr. Smith's department. At the 16-hour level is the line of staff time made available by two nurses. Above this line and beneath the curve of required time is a dotted area that represents a deficit in staff time required to insure *minimum quality* attention to Direct Service cases.

Time does not permit a detailed discussion of all conditions implied in this graph. We will raise only a few questions as to the probabilities:

1. What is the quality of medicine, nursing service, and human relations?
2. What is the character of the employee's appraisal?
3. What will happen if a staff member is absent?
4. Does the performance by nurses of a daily average requirement of seven hours of purely clerical work constitute a wastage of nursing skill and service?
5. What is the character of the staff morale and working environment?
6. What are the potentials and incentives to make progress and to engage in research?

Compare the picture of Dr. Smith with that of Dr. Jones on the left. The line of available time produced by his four-member staff stands at 32 hours. This is always above the curve of required time for Direct Service. It is only in that range *above* the curve of Direct Service time requirement that management is justified in expecting returns on its medical investment in terms of prevention and progress.

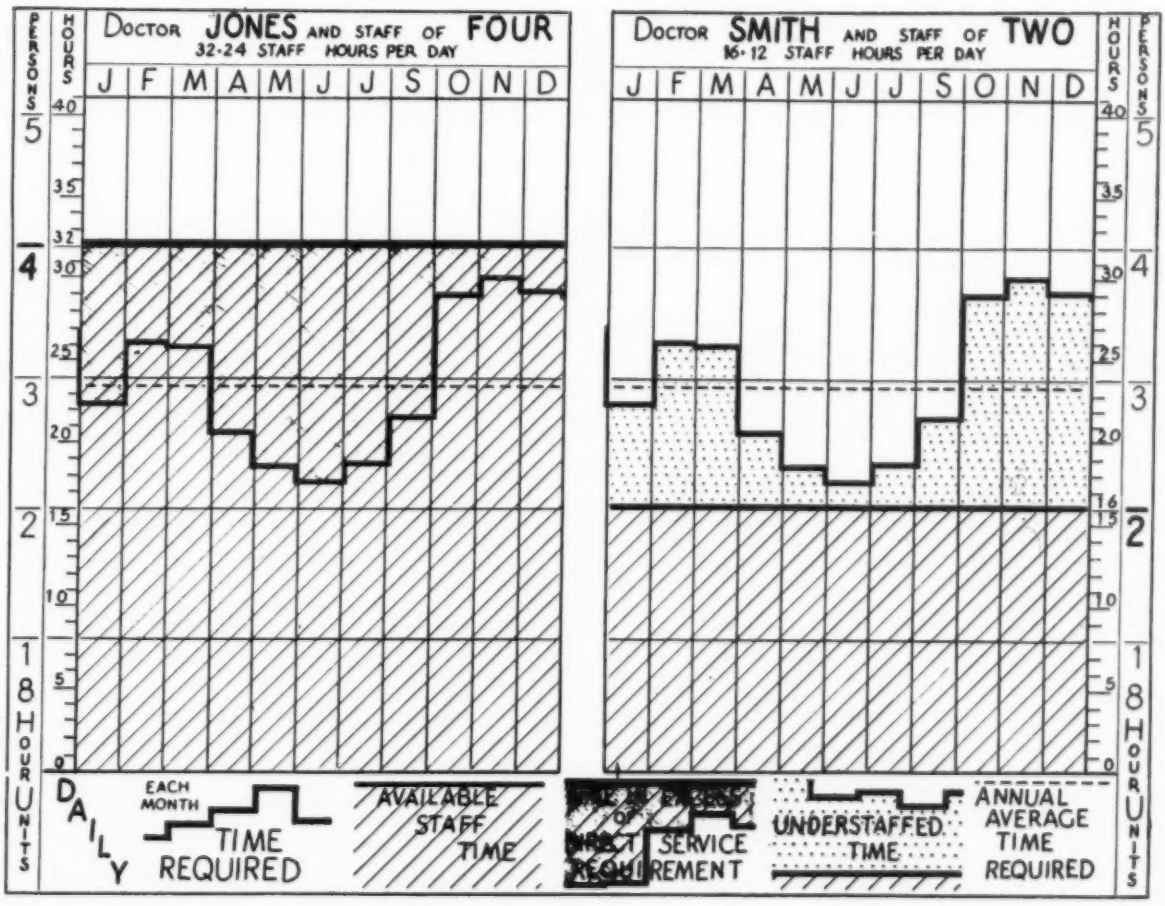


FIG. 2.

So far our discussion has been limited to those services classified as Direct. How can we compare the potential scope of these two departments for adventure beyond this classification? It is self-evident that you must have time in excess of that required to dispose of this classification before you can effectively adventure beyond. Hence, we will graph the available staff times of these two departments in terms of an excess (above) or a deficit (below) the actual time required to dispose of Direct Service.

There is nothing elaborate in the physical examination procedures outlined in Tables 9 and 10, and we know that the times are quite conservative. It is analyses such as this that have prompted the following opinion of the medical value of physical examinations in industrial practice—"Take less than 17 minutes of total medical staff time for each (including six minute exposure to the physician) and the intelligence of your patient will have been insulted; your record scarcely worth the paper it is written on."

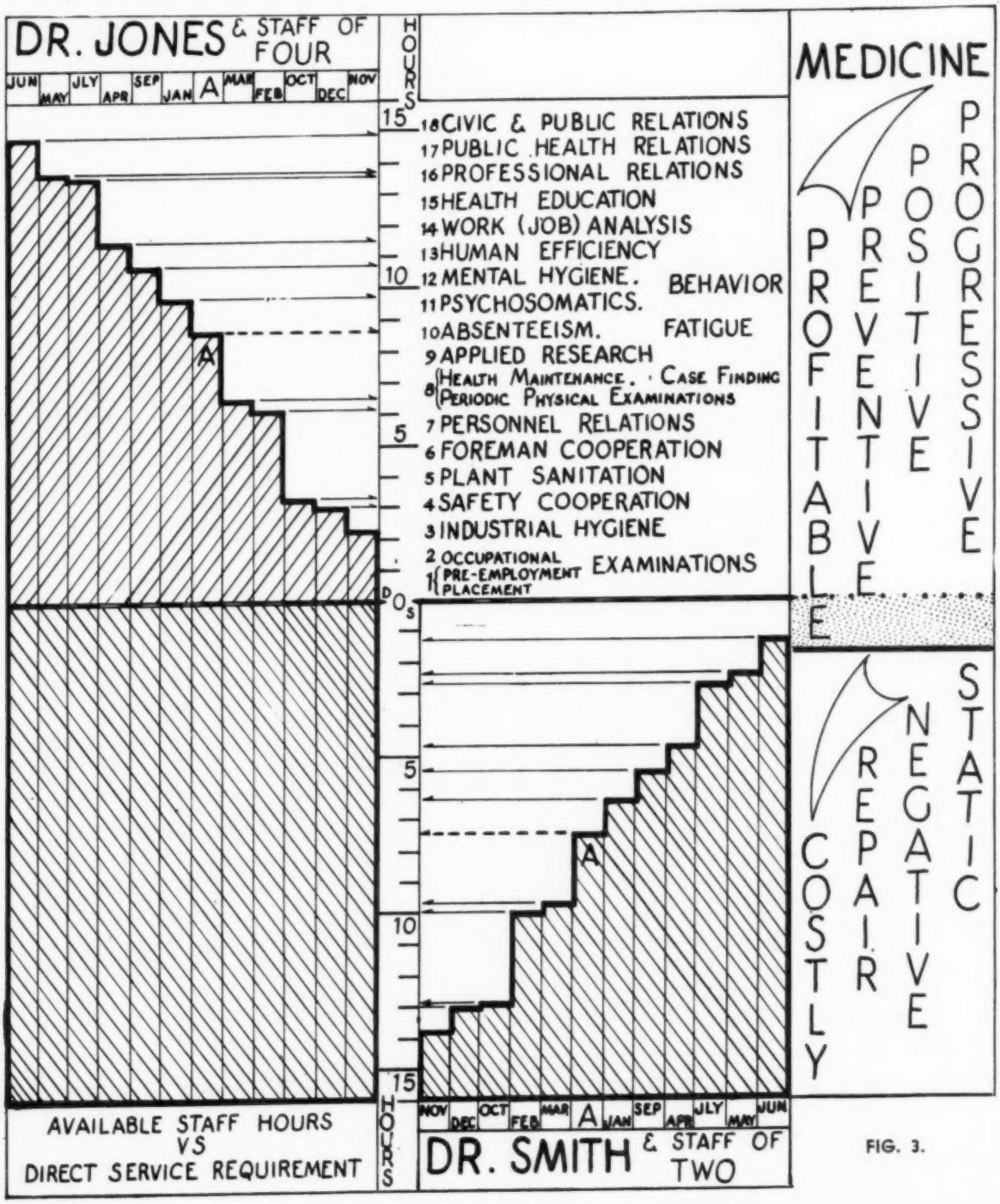


FIG. 3.

MEDICAL TIME ANALYSIS	DR. JONES STAFF HOURS 32.24		DAILY	DR. SMITH STAFF HOURS 16.12	
	SURPLUS ← ABOVE		DIRECT SERVICE REQUIREMENT HOURS	BELOW → DEFICIT	
	%	STAFF HOURS		STAFF HOURS	%
JUNE	+ 85.0%	+14.8	17.4	− 1.3	−7.4%
MAY	74.9	13.7	18.5	2.4	12.9
JULY	71.2	13.4	18.8	2.7	14.3
APRIL	54.8	11.4	20.8	4.7	22.6
SEP.	49.9	10.2	21.6	5.5	25.4
JAN.	43.1	9.7	22.5	6.4	28.4
ANNUAL AVERAGE	+ 36.4%	+8.6	23.6	− 7.5	−31.7%
MARCH	24.8	6.4	25.8	9.7	37.5
FEB.	23.3	6.1	26.1	10.9	38.3
OCT.	11.9	3.4	29.9	12.9	44.4
DEC.	10.3	3.0	29.4	13.9	44.5
NOV.	+ 7.3%	+2.2	30.0	− 13.8	−46.0%
		GRAPH		GRAPH	

AVAILABLE STAFF HOURS -VS- DIRECT SERVICE REQUIREMENT

FIG. 4.

We should also pause to point out that Dr. Smith's department has recorded a total of 1,618 physical examinations.

In Fig. 3 we examine the potentials in terms of the staff time available to these respective departments for excursions beyond Direct Services. In the upper right quarter we have arranged from below upward, in the relative order of their practical importance and value to industry, services not heretofore mentioned. These are classified as *Indirect* Services, but time does not allow a detailed description of their scope. The straight line across both graphs represents the Direct Service or zero line. Between the two graphs is a vertical column graduated in hours. Projected upon this column by arrows is the average daily available staff time for each month and the year for the respective departments, either a deficiency (below the zero line) or an excess (above the zero line) in time required for Direct Services. The plotting data for this graph are shown in Fig. 4.

The same six questions raised in the previous graph can be raised in regard to this one. Two additional questions may be posed.

7. What are the medical value and quality of the 1,618 physical examinations performed by the respective departments, and what is the potential quality of excursions beyond Direct Services?

8. What would be the effect upon the incentives and morale of a physician or a nurse, who, after being prepared and trained for industrial medicine in a department such as Dr. Jones', was put to work in a department such as Dr. Smith's?

As to the comparison of medical departments by cost, consider the possibilities afforded these two, each having more than 30,000 intimate personal contacts in one year. One penny's worth of bad medicine will be multiplied to a dollar's worth of bad human relations. Granted that Dr. Smith's direct costs are one-third less than those of Dr. Jones, still should we not figure such intangibles as good will and a host of others as a debit to be added to Dr. Smith's budget and a credit to Dr. Jones' account? You cannot throw medicine in competition or comparison with a material product dollar mark on a ledger and get anything but a flat cost. True, the medicine dispensed by Dr. Smith's department is cheap. My appraisal would be about two cents worth of medicine on the invested dollar.

To some extent, this graph demonstrates that

TABLE 11.
GENERAL RULE NO. 2 (1:15 per Shift)

Its use in determining the number of Hospital Personnel adequate to provide service to 1560 employees on one shift.

$\frac{1560}{15}$ = 104 Direct Service Cases (Daily Expectancy)

104 × 11.57 minutes (time study)	= 20.05 hours	
30% Daily Variation Requirement	= 6.02 hours	
Daily Hospital Time Required	26.07 hours	
70% Treatment Time	= 18.249 hours—2 or 3 nurses	
30% Clerical Time	= 7.821 hours—1 clerk	
	—2.249	+5.75 hrs.

when you consistently man your departments closer in available time to your Direct Service time requirement, you may lower your cost, but you also accelerate a law of diminishing returns on your investment, not only in the values of good human relations, but also in diminishing profits from the practice of the positive, preventive and progressive phases of industrial medicine.

Direct services are a fair cross-section of the day to day scope of general medical practice. Let us assume that instead of available staff hours for the industrial department, we are graphing the available time of general practitioners or family physicians. The area *above* the Direct Service line will be considered the potential field for good human relations inherent in personalized care and individual attention. Such a graph would demonstrate a probable law of diminishing returns in the field of good human relations, attributable to a reduction of the proportionate number of general practitioners in the whole medical profession.

His tremendous number of contacts brings the industrial physician very close to the people. Almost daily he finds himself placed in the position of ambassador between numerous patients and the general profession, hearing it both extolled and excoriated. He cannot escape an awareness that the people hunger for personal human relations in their everyday existence and that this is their chief desire and mainstay in time of anxiety or distress. There is an enormity of implication in the growing feeling among the people that "doctors will not make house calls any more." Whether there should be more family physicians, or whether more stress should be placed upon human relations during the training of specialists, are questions that the profession and its educators might do well to keep under constant scrutiny. I have seen enough to feel certain that the perpetuation of medicine as an art depends more upon its spiritual values in the hearts of the people than upon its specific scientific triumphs.

This presentation would be incomplete without a demonstration of the use of the Rate and the Time Factors in predetermining adequate medical manpower. (Table 11.) As an example, we chose a manufacturing industry that plans to establish a one-shift medical department to efficiently cover Direct Services and to make excursions into Indirect Services of reasonable quality. The average number of employees *who will have access* to this department is 1560.

Example: $\frac{\text{1560 employees}}{\text{15 (1:15 Rate Factor)}}$ = 104 Direct Service cases per shift

104 cases × 11.57 minutes (Time Factor) = 20.05 hours

Thus 20.05 staff hours per shift is the *unadulterated* time requirement. No allowance is made for the numerous variables that consistently occur throughout the operating days and hours of every industrial medical department. There is a consistent day-to-day variation of 30% above or below this average daily expectancy of 104 Direct Service cases; i.e., 135—104—73 cases. Hence, we add 30%, or 6.02 hours, to our 20.05 hours, making a total staff time requirement per shift of 26.07 hours.

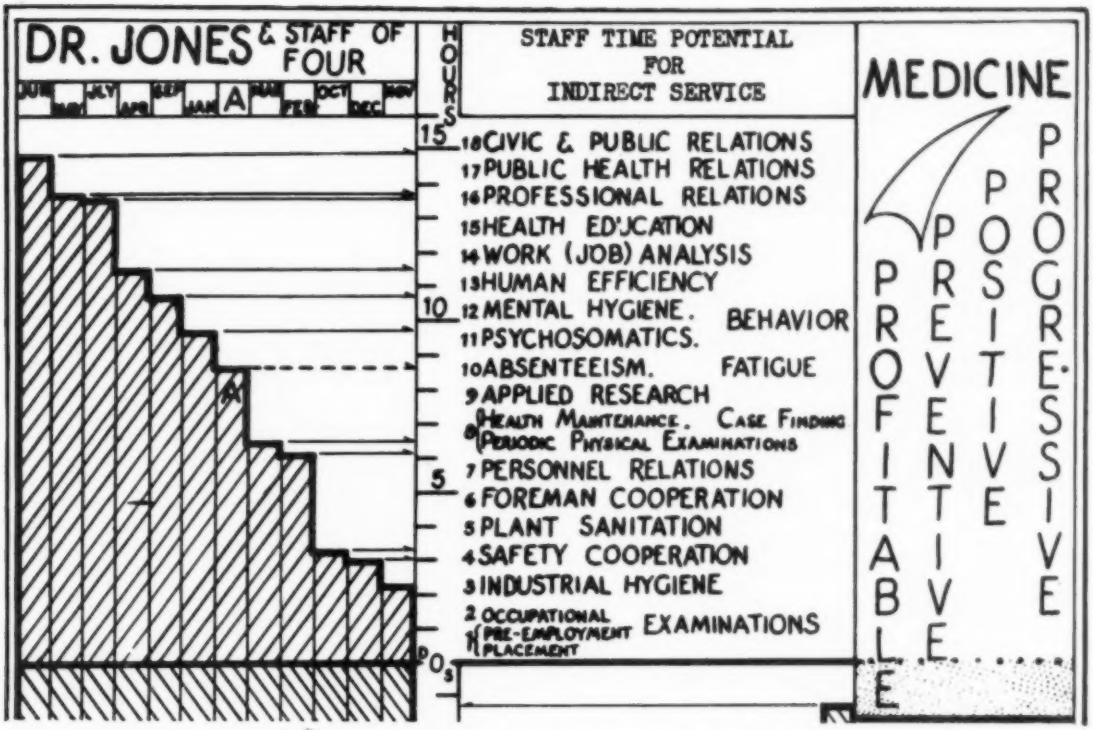
Breaking this down into 70% treatment or professional time and 30% clerical time, we conclude that the average daily professional time requirement is 18.249 hours; the clerical time requirement 7.821 hours. There is an obvious full day's clerical work. Two nurses will leave an average daily deficiency of 2.25 professional hours. Three nurses will give an excess of 5.8 hours. It is management's prerogative to choose between these two alternatives. A full-time physician is taken for granted.

Let us make it emphatically clear that the addition of 30% to the unadulterated Direct Service time requirement does NOT "promise the moon" in the extent of medical services. We have clearly defined and classified Direct Services and allotted an average specific time of 11.57 minutes to them. Specific times were also allotted to pre-employment and periodic examinations (Table 9) —WITHOUT TECHNICAL HELP—namely, 27 and 25 minutes respectively. Doctors Smith and Jones had no x-ray, laboratory facilities, or technicians. Credited to their departments are 1,618 examinations of the following descriptions:

Pre-employment-Placement Examinations	426
Occupational Examinations	204
Periodic Health Maintenance Examinations	988
Total	1,618

The four-person staff assigned to Doctor Jones to insure *minimum* quality attention to Direct Service and sufficient flexibility for *minimum* quality excursions into Indirect Services has, in fact, an average daily available staff time for the year 36.4% *IN EXCESS* OF THAT REQUIRED FOR DIRECT SERVICE. (Note "Annual Average"—Fig. 4.)

With these facts in mind, Fig. 5 and notes will be sufficient to indicate the limitations and the potential scope, quality, and variables involved in the excursions of Doctor Jones' department into Indirect Services.



From left to right in order from greatest to least, the columns represent the daily average staff hours IN EXCESS OF THE STAFF HOURS REQUIRED BY DIRECT SERVICE, for each month and the year. (A)

The items of INDIRECT SERVICE are arranged upward from the direct service line (DOs) at the bottom, in order of their FIRST IMPORTANCE in the practical administration of Industrial Medicine.

The projection of the available staff time upon the Indirect Service items by arrows indicates the following potentials and limitations:

1. Beginning at the left, each of the first six months named has sufficient staff time available to consistently insure a good quality performance of the first ELEVEN items of Indirect Service. A good quality coverage of the phases of industrial health administration implied in ALL listed items is possible and can be reasonably expected within those months.

2. (A) Dr. Jones has available an annual average daily staff time that is 36.4% in excess of that required for Direct Service; a potential for a generally fair coverage during the year of the first TEN items of Indirect Service.

3. Time in the months of March and February is not sufficient for a fair coverage beyond the SEVENTH item. Periodic examinations would require strained effort.

4. October, December, and November afford only sufficient time for coverage of the first THREE items. Excursion beyond the first FOUR items that might be claimed is open to serious question as to quality and value.

FIG. 5.

Not long ago I talked with two industrial executives. Said one, "I am a little tired of having you doctors ask us what we want you to do. It is your job to tell us what should be done and how to do it." Said the other, "I am convinced that the doctor is invaluable *out in the plant*, and I wish more of them would get out there among the people."

WE HAVE in some fashion attempted to give to the industrial physician a tool with which objectively to answer both executives. Also, we have tried to give to management a tool for measure and appraisal; a tool to permit the means by which more industrial medical departments will be freed from confinement within their four dispensary walls to carry their services out among all their people; a tool with which to gauge the potential returns on their investment.

To the general medical profession, we suggest that this tool may be used to add another facet to their stamp of professional approval. It is not enough that medicine be administered by qualified personnel. There should be some guarantee of a reasonable quality of human relations. As before stated, I believe the future of medicine depends critically upon this priceless ingredient.

This presentation is no final authoritative word. It should suggest the desirability of more research along these lines by the industrial physicians and nurses themselves, and the establishment of some clearing house where the data may be coordinated, evaluated, and put to work.

Industrial medicine contains a wealth of ma-

terial for study and research, which is of incalculable value in promoting national health. "Public Hygiene is built upon, is controlled and directed by, and everlastingly indebted to vital statistics. Every wheel that turns in the service of public health must be belted to that shaft. Farr's ultimate aim was to register ALL the sickness among the civilian population as completely as is done in the army." Industrial Medicine possesses the potential to vitalize this aim. It has a great and unique opportunity in having a cross section of the *all-age* adult population over long periods of time under constant care and observation. A potential cross-section of 60 million, containing every degree of good health as well as every degree of sickness and disability. We have in the past demonstrated that study of minor day-to-day sick complaints in industry forecasts not only epidemic but good health trends in the nation as a whole. The potentials of Industrial Medicine to advance the science of epidemiology have scarcely been scratched. It is my belief that coordinated industrial medical reporting in this nation of the information that parades every day and hour through the factory hospital doors is capable of creating a veritable barometer of national health that can become as reliable and useful as the meteorological data and forecasts of our Weather Bureau.

WHAT is the potential for national correlation of the specific studies presented here? If all people have unrestrained access to medical service at no cost, we feel that all of the human factors demonstrated in this study will immediately go into action. Our *30%* segment will monopolize 85% of medicine's time. A horde of locusts will be unleashed that will decrease the effectiveness of available medical manpower by 40 to 50%. At least 50% of the visits will not have two cents' worth of any condition that medicine can diagnose, cure, treat, or prevent. These studies indicate that the determination of the required number and the distribution of *physicians* is less than half the necessary planning. Analysis and distribution of the *patients*, and of their potential *reactions to freedom from cost and restraint*, are of equal importance.

Assume that there is one doctor for each 800 of the population and that the doctors are evenly distributed. What will the people demand of each doctor? Even though the accident severity rate is markedly higher among the private pursuits of the citizens than it is in the course of their employment, we will not insist on our 1:15 rate per day. Our rate covers only the population from 18 years to the grave. Add to it, however, the potential in the population from 18 years to the cradle of the first born with anxious parents. It is reasonable and, I believe, conservative to feel that one out of every 25 of the total population will find some reason to make a call on the doctor every day. If so, then the *average* daily load of your evenly distributed doctors will be 32 visitations per day, for services that we have classified and characterized as Direct. The 1% to 2% will be emergencies. Recall that competent nurses removed the necessity for the industrial physician to see more than 20% of these cases. We believe that uncontrolled access by all people will unbridle the type of hysteria that will demand direct audience with a physician in the majority of cases.

Whether the doctor will have time left after this daily stint to make diagnostic studies, give each of his 800 "God's chilluns" an annual health maintenance examination, and engage in all the positive, preventive, and progressive phases of medicine is indeed a moot question. The *quality* of medical service under such circumstances is likely to be critically challenged.

Perhaps within these studies lie the basic reasons for the dilemma now being enjoyed by the British medical profession, and for such press notices as this on December 8, 1948:

"Sir Richard Gregory, British scientist, recently told a mothers' clinic in London that it may soon be necessary to get permission to become a parent because of the increasing burden on the nationalized medical profession."

I am of the opinion that there are sincere and stalwart men among the profession, the laity, management, labor, and the politicians, who will accord the proper importance in national planning to studies such as this—studies that are a potential unique to industrial medical research.

Industrial physicians, armed with truth and possessing the tradition of a broad view, can go far in promoting middle-of-the-road thoughts. As earnest citizens, they can and should go far in checking evils that may befall their nation. It might be well for industrial physicians to offer a prayer, not for opportunities on which to exercise our attainments, but for attainments equal to the vast potentials and opportunities that surround us every day.

Herniated Intervertebral Disk

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In 1934, Mixter and Barr described the clinical entity now known as herniation of the intervertebral disk. The attention of the medical world became focused upon a clinical syndrome not recognized previously. The intervertebral disk and the nucleus pulposus emerged from a position of obscurity to attain a position of tremendous importance and interest in a few brief years. The term herniated disk became a commonplace term among all members of the profession and especially among orthopedic and neurological surgeons. At present it is becoming of commonplace usage by the laity.

The embryology and anatomy of the intervertebral disk have been known to anatomists for a long period, but its functions and dysfunctions have been appreciated only during the past few years. Schmorl wrote the first of an extensive series on this subject in 1927, attracting medical attention to the significance of this unique structure of the vertebral column. His contribution has been recognized by the universal designation of certain vertebral defects as Schmorl's nodes. Beadle, who worked with Schmorl, summarized the latter's work in a monograph in English in 1931.

In the years following the presentation of the clinical and operative observations by Mixter and Barr, medical literature has been filled with reports of extensive studies, clinical, pathological and therapeutic. Today the term "herniated disk" is accepted as widely as was the term sacro-iliac sprain a generation ago. The diagnostic pendulum of herniated disk has reached its greatest excursion and is gradually swinging back to a center where a true evaluation of this entity may be forthcoming. No longer do we hear of long series of cases with 100% relief obtained by surgery. Greater emphasis is being placed on conservative treatment. Sciatica frequently subsides without surgical interference, and by the same token it not infrequently recurs after surgical removal of a typical herniated disk. The true significance of the disk problem probably lies between the extremes of conservatism and operative intervention.

Prior to our present concept of disk pathology, reports of extra dural chondromas revealed by surgery were encountered. The true significance of these tumors was not fully recognized. The intervertebral disk is a unique structure interposed between the nearly flat surfaces of the cancellous bodies of adjacent vertebrae. It is roughly disk-like in shape. During the period of vertebral growth it is adjacent to and limited by the growth plate of the vertebral bodies. It consists of a periphery of vertical and of more or less concentric fibers which form the annulus fibrosus. These fibers are more dense at the periphery becoming less compact toward the center of the disk where they blend into a soft semi-liquid center, the nucleus pulposus, the remains of the

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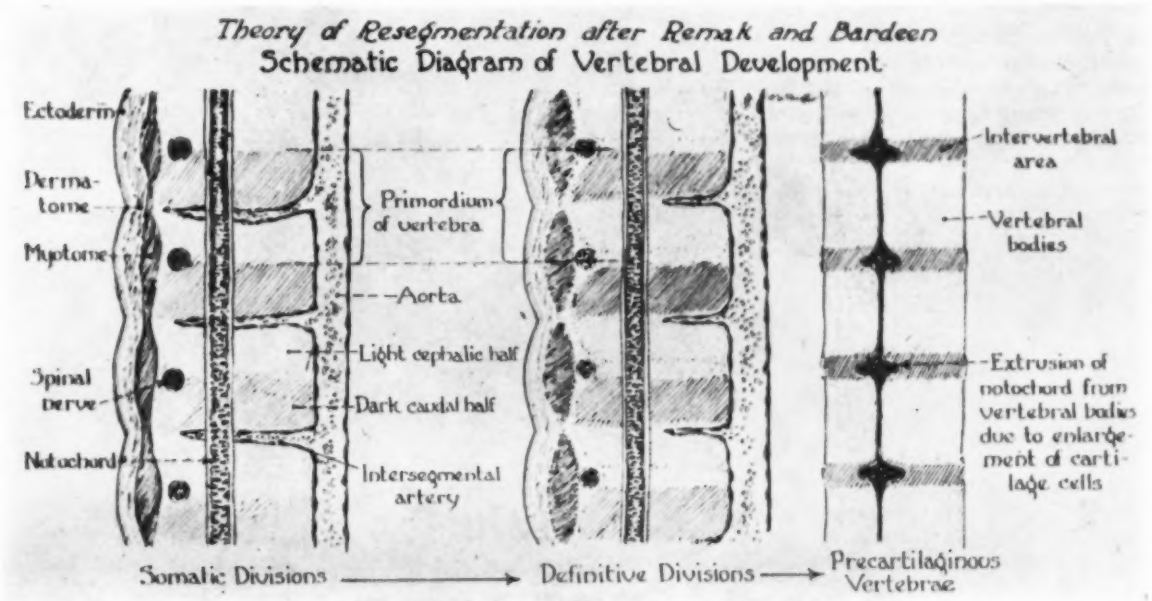

Fig. 1.
Embryology of notochord and disk (Keyes and Compere)

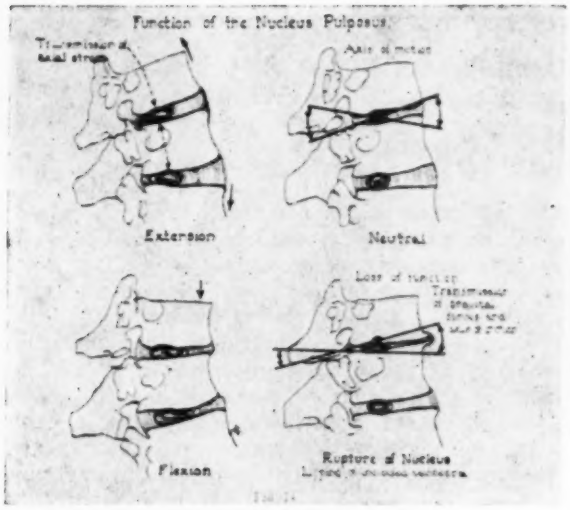

Fig. 2.
Function of nucleus pulposus (Keyes and Compere)

primitive notocord. The blood supply of the disk is meager; small vessels penetrate the periphery a short distance and then disappear. The metabolic coefficient of the entire disk and especially that of the nucleus is probably very low in view of the scanty blood supply and the compression of the structure secondary to the tension of the trunk and spinal muscles, the longitudinal ligaments and weight bearing. The observation that the spinal column is somewhat longer after periods of recumbency may be significant in an understanding of the nutrition of the disk. The internal pressure of the disk is reflected under various conditions. Should the growth plate of the vertebral body be defective as the result of irregular development or owing to some nutritional disturbance, the disk substance bulges into the cancellous bone, forming Schmorl's nodes. Should the confining surface of the vertebral surface be fractured the more fluid element of the disk may extrude into the adjacent cancellous bone. If the resistance of the cancellous bone of the vertebral body is weakened as in some blood dyscrasias (leukemia) or in fragilitas osseum,

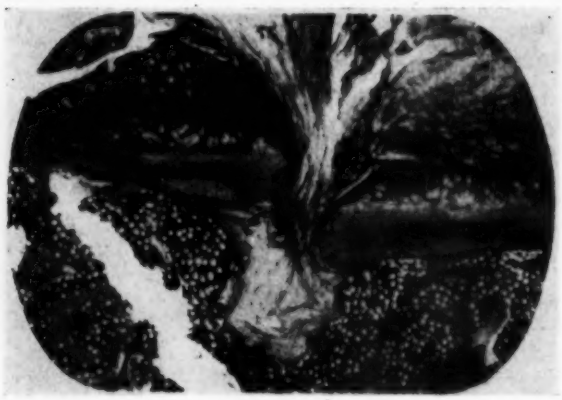

Fig. 4.
Herniation of disk into cancellous body of vertebra through fracture of growth plate (Beadle)

Fig. 3.
Spinal changes between 3rd and 4th lumbar vertebrae in herniated intervertebral disk

the surfaces of the disk will become convex and the so-called fish type vertebra result.

In the normal vertebral column, the disk functions as an elastic fulcrum permitting movement in all directions to the limit of the checking effect of the spinal ligaments and the bony contours of the lateral articulations. To function normally as an intervertebral fulcrum the disk must of necessity be intact in shape, elasticity and composition. This phase will be discussed later.

The vertebral body grows in size superiorly, inferiorly and anteriorly, but does not grow posteriorly. This results in an eccentric position of the nucleus, it being somewhat posterior to the central axis, especially in the lumbar region.

The foregoing concepts of herniation of the intervertebral disks do not reflect the more popular version of disk pathology but do permit observations of resulting dysfunction. When the fulcrum action of the disk is lost, mobility of adjacent vertebrae is disturbed, the lateral facets tend to override. The margins of the vertebrae come into closer contact and the resulting irritation stimulates new bone formation (spurs) further restricting motion.

THE problem of herniated disk confronting most of us is that clinical picture of acute low back

Fig. 5.
Spinogram herniated disk between 4th and 5th lumbar

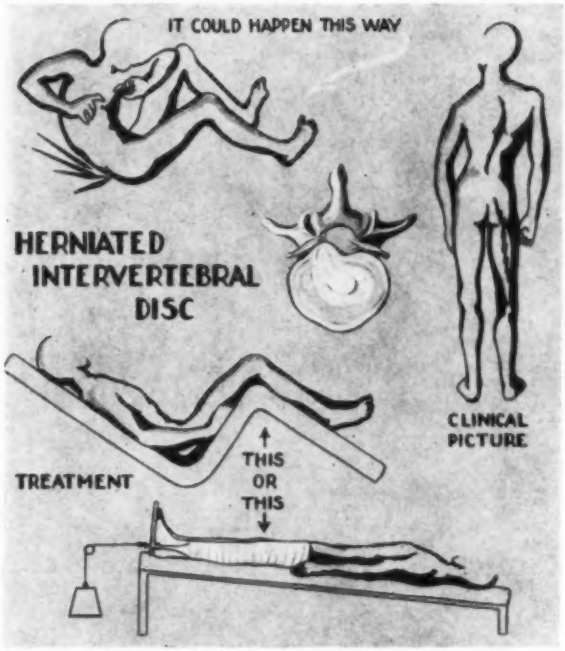

Fig. 6.
Non-operative treatment of herniated intervertebral disk

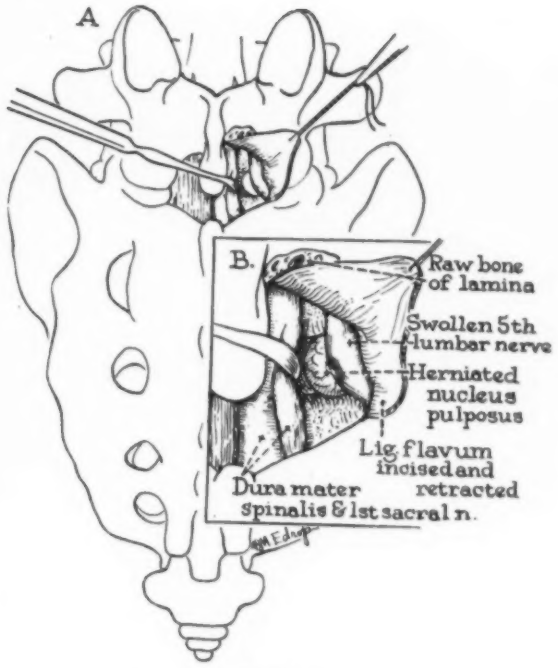

Fig. 7.
(A) Herniated intervertebral disk revealed by partial laminectomy of lower margin of lamina of 5th lumbar vertebra on right and reflection of ligamentum flavum. (B) Enlarged drawings of operative exposure showing relation of 5th lumbar nerve

pain associated with sciatic irritation. A patient while performing some particular movement feels something give way in his lower back and simultaneously or at a later date develops pain along the sciatic distribution. He develops a sciatic list of the spine, and experiences radiation of pain on sudden effort as in coughing or sneezing, straining at stool or turning in bed. These episodes vary considerably in intensity, and over a period of time are apt to be recurrent. Straight-leg flexion of the affected side is limited and radiation may be increased on straight-leg flexion of the uninvolved extremity. The Achilles reflex is diminished or lost. Sensation may be impaired along the branches of the sciatic nerve. The sciatic picture may be prominent with little or no lumbo-sacral discomfort, or the symptoms may be reversed in severity. Compression of the jugular veins may result in increased radiation. Such a clinical picture may be initiated by such a simple movement as stooping to pick up a handkerchief from the floor or a severe effort calling for maximum exertion.

To state that a thorough examination of the patient should be done may seem superfluous, but there are surgeons who will operate for disks on the patient's history alone, not bothering even to test the reflexes. A good general examination is always in order. Special attention should be given to the orthopedic and neurological phases, and a careful interpretation of the x-ray films is essential. Measurements of the legs for length and circumference will frequently reveal atrophy.

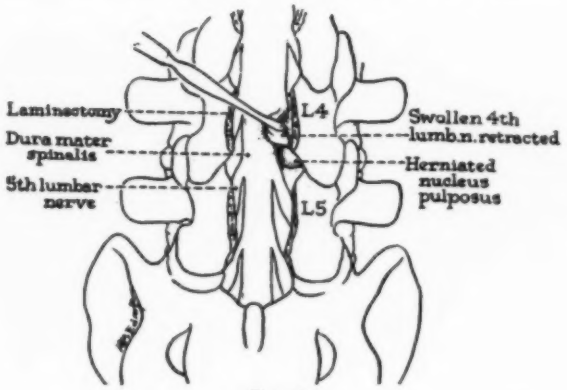

Fig. 8.
Herniated intervertebral disk on right between 4th and 5th lumbar vertebrae by laminectomy of 4th and 5th lumbar

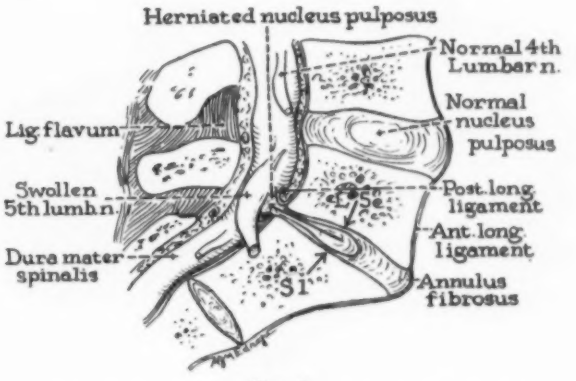

Fig. 9.
Lateral view of herniated disk between 5th lumbar and 1st sacral vertebrae. Note relation to nerve and thinning of intervertebral space

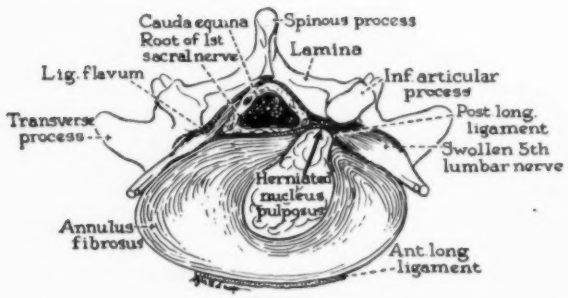

Fig. 10.
Herniated disk from above showing encroachment on lateral vertebral foramen and on 5th lumbar nerve

The knee jerks should be tested in the supine and sitting postures with reinforcement, if necessary. The Achilles reflex should be sought with the patient supine, sitting and kneeling. The spine, buttocks and legs should be thoroughly palpated and mobility ascertained. Rectal and pelvic examinations should not be neglected. Laboratory and x-rays need only be mentioned as important.

Considerable difference of opinion is received regarding the merits of spinograms using air or opaque material. If these are employed, the fact that they may be inaccurate must be kept in mind. Sciatica may result from many pathological processes other than herniated disks, and this possibility is ever present.

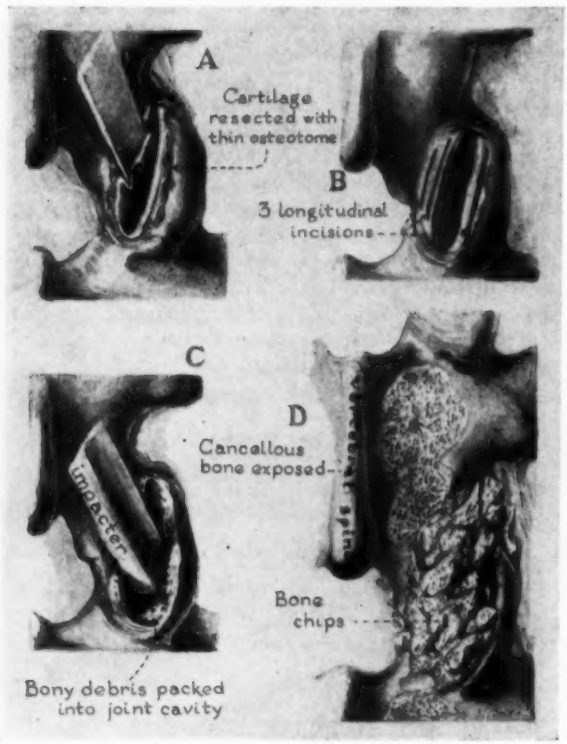

Fig. 12.
New technique of lumbo-sacral (Chandler).
(A) Excision of articular cartilage of lateral facets.
(B) Incision of bone adjacent to articulations.
(C) Impaction of bone to bridge lateral articulation.
(D) Removal of cortical bone lamina. Bone chips to cover area of lateral articulation

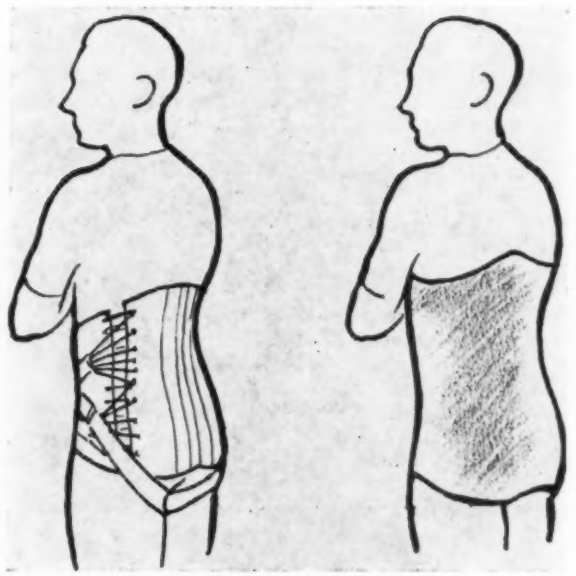

Fig. 11.
Lumbo-sacral corset and cast as part of the conservative treatment of herniated disk

ASSUMING that we are confident that the clinical picture is compatible with that caused by herniated disk, what must we conceive as to the probable local pathologic conditions present? Because of some acute or chronic force, a portion of the intervertebral disk has been propelled posteriorly into the central neural foramen with the resulting insult to the lumbar root or roots. The disk being composed of nuclear and fibrous

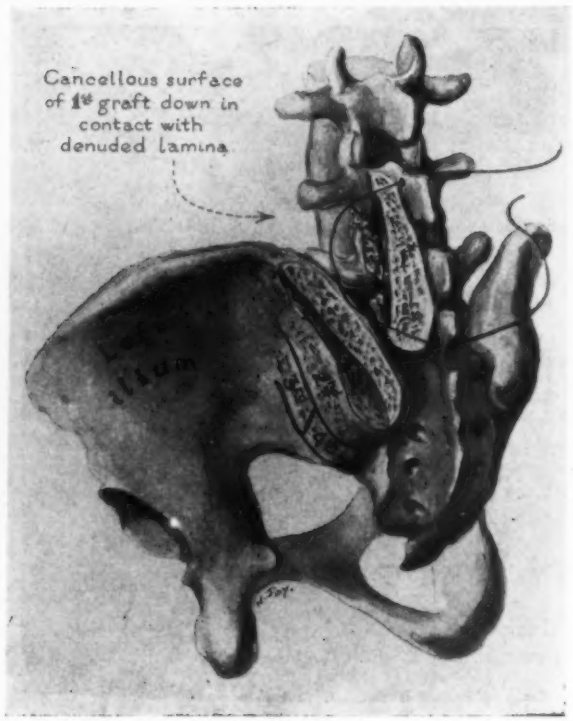

Fig. 13.
Massive cancellous grafts taken from posterior ilium. Showing position of fixation wire

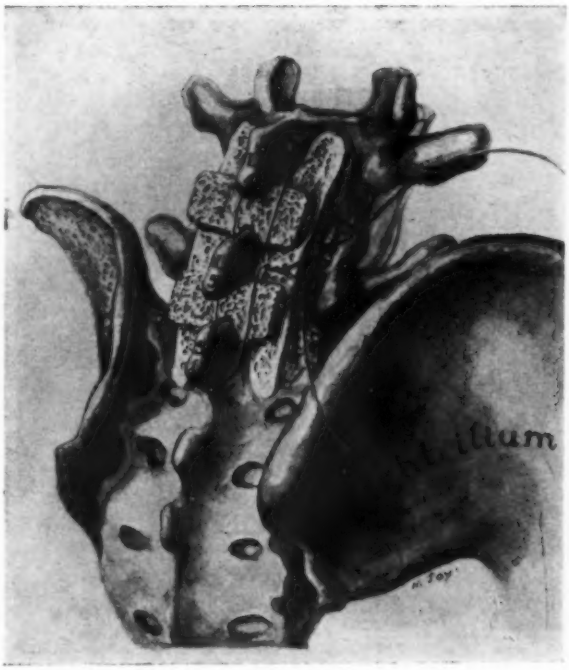

Fig. 14.
Iliac grafts in position to right and left of spinous processes with notched cross grafts separating spinous processes. Wire is drawn taut immobilizing area of fusion and holding grafts in firm contact with denuded laminae

elements, either or both elements may be displaced from their normal positions between the vertebral bodies. They may protrude centrally, laterally and even into the lateral neural foramen. Their position in relation to the nerve roots is reflected to some degree by the physical findings on examination. When both the fibrous and nuclear elements are displaced they usually present a bulging mass under the posterior longitudinal ligament or it may escape through a rent in the ligament and appear almost free within the canal. The margins of the disk may be torn and bone fragments or, in older cases, bony spurs may be encountered. The nerve roots are frequently compressed and the nerve sheaths become edematous.

In most cases pressure upon the nerve root alone does not explain the sequence of events. Pressure upon a mixed nerve elsewhere produces pain, parasthesia, anesthesia and paralysis; the element of pain does not persist throughout the entire course as a rule. In herniated disks, pain is a most prominent picture, often in cases where only a small herniation is present and where little or no real pressure upon the nerve root can be demonstrated. The cycle of symptoms in disk cases is usually of several weeks or months and does not reveal the in-and-out symptoms which might be expected with varying pressure. I recognize the probability of pressure upon the nerve root as being a major factor but believe that other irritating factors may be present. I can conceive that nuclear material adapted to scanty circulation and considerable pressure could disintegrate when released from that environment by herniation. It is entirely possible that some of these products of disintegration act as irritants to the nerve root. We do know that the physical qualities of the nuclear material are altered in nuclear extrusions. Some soften, others, probably older, become encased in calcium deposits. Investigation of these factors should be undertaken.

IF WE KEEP in mind the local relation of the herniated or protruded disk to the nerve roots as well as the disturbed function of the spine which results from the loss of the fulcrum formed normally by the nucleus pulposus, we can approach the subject of treatment more intelligently. Inasmuch as herniations of the disk vary in degree and severity and the prognosis in any case is at best somewhat uncertain, it is well to err on the conservative side. The patient should be put to bed in order to minimize weight bearing. His position as to flexion or extension of the spine should be dictated by his comfort or discomfort. Traction to legs and pelvis aids. Local heat is beneficial, deep heat tends to aggravate the discomfort. Corsets or body casts may permit earlier activity. If these procedures are followed by relief, they should be continued, and when able the patient should gradually return to normal activity. Most cases will respond to conservative measures. Should symptoms continue unduly long or become of a recurrent nature, operation is advisable. At operation, two objectives should be considered. Excision of the herniated disk and restoration of the stability of the spine. In many instances, excision of the disk alone suffices. However, many of these cases continue to have low back symptoms. This necessitates a secondary stabilizing operation. Because of this there is an increasing tendency towards carrying out both procedures at the same time. When the newer techniques of spine fusion are employed, the patient becomes ambulatory as early as when excision of the herniated disk alone is done. The surgeon attempting to operate upon these cases should be qualified to do both phases efficiently and also be prepared to meet the unexpected, for other pathologic conditions of the spine and nerve elements may be encountered.

Herniated intervertebral disks occur most frequently in the lower lumbar region but may occur at any level. This is particularly true of the lower cervical where symptoms not unlike sciatica but involving the brachial plexus roots present themselves.

The treatment of cervical disks is based upon the same general principles as those employed in the lumbar region.

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The American Academy of Compensation Medicine

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THE Workmen's Compensation Law is a modern conception of the employer's liability to his injured workman more adapted to the present industrial age, with its mass production, its highly mechanized processes and its use of dangerous chemicals and toxic substances. Unlike the old system of employer's liability, compensation laws confer upon the injured employee the right to necessary medical treatment at the expense of his employer. This was a tremendous advance in all its implications and is an outstanding feature of the whole compensation system. At the same time it imposes certain duties and obligations upon the physician, and a definite legal and social responsibility upon the whole medical profession. Without the intelligent cooperation of the doctors, adequate administration of the law would not be possible.

Of greatest importance to the injured worker is the provision for furnishing prompt, full and adequate medical care and treatment, including necessary hospitalization and nursing care, and the furnishing of suitable prosthetic appliances. That is not the whole of the medical profession's responsibility, under the law. There must also be ascertained and record made of all pertinent medical facts, including an adequate history of the injury, if by accident, and the nature and degree of exposure, if by occupational disease. The reporting of these facts and the expression of medical opinion and judgment, based upon such facts, become an integral and an essential part of the administration of any compensation law. The earliest compensation law enacted in this country was in 1908, while at the present time, all 48 states, the District of Columbia, the Federal government and all of our island territories, have workmen's compensation laws.

In the third of a century that has passed since the beginning of the compensation life of the country, great advances have been made in the system. Coverage of the laws has been broadened; administration of the laws has been radically improved since the first experimental procedures were set up; benefits have been liberalized; accident prevention measures and wide safety education have resulted in the establishment of safety planning as a definite branch of engineering; and the medical profession has been alerted to its responsibilities in the care and treatment of accident and disease conditions.

But the interest of the physician, the specialist as well as the general practitioner, has lagged in utilizing the full opportunities and assuming the responsibilities with respect not only to the obscure case, but also in the many problems in diagnosis and treatment, in causation and etiology, and in the complication and combination of injury and disablement of workmen. Intricate as many of the problems are, involved as are the many complications, it is noteworthy that there has been no formal education that is at all adequate in the field of compensation medicine. Only lately has there been any recognition of the need for education in this field, and that only by a small number of progressive medical schools. Where the subject is included in the curriculum, the teaching is limited by the time available.

Moreover, compensation medicine, with its many ramifications and with its close relationship to almost every special field of medical practice, has not developed a standing as a distinct specialty itself, although many practitioners devote either all or a large part of their time to practice in this field.

Although the diagnosis and therapeutic procedures are no different in compensation medicine from what they are in private practice, the physician who is interested in or specializes in what may be commonly referred to as "compensation medicine" is charged with a duty primarily to his patient, as well as to the employer who is liable for the payment of medical charges, but additionally to the public authorities responsible for the administration of the compensation law. Thus the traditional relationship of physician and patient is very greatly changed, and the doctor in the compensation case is called upon to discharge in high degree a definite public function. He must not only render the best type of treatment and employ the highest skills in caring for the victim of industrial accident or occupational disease, but he must also be prepared when called upon to express an unequivocal opinion as to whether the conditions he examines or treats bear a causal relationship to the employment or to an occurrence arising out of such employment such as would bring the condition within the purview of the law. He must also be alert to extraneous and unrelated existing conditions, not due to the accident or occupational disease, but which may be thought to aggravate or complicate the condition upon which a claim may rest, and he is in all good conscience obligated to express his opinion truthfully and without bias as to whether such condition has contributed to the disability or death, and if so, in what way and to what extent. Accurate and detailed records in all compensation cases are important both for the interest of the injured workman and for the medical evaluation of any subsequent complication alleged.

THE system of workmen's compensation, while differing in many particulars in different states, in such matters as the benefits provided, the periods during which benefits are payable, procedures for adjudication and payment of claims, the provisions for medical treatment, and the provisions for the security of the employer's

obligations by insurance or otherwise, has certain common characteristics that prevail in most of our states.

One of the principles inherent in all compensation systems is the right of the injured worker to receive adequate and prompt medical care and treatment for his injury arising out of his employment. Such injuries may result from an accident arising out of and in the course of employment. In many states, however, the law provides coverage for occupational diseases. The development of occupational disease provisions in the law is of somewhat more recent origin than the provisions for accidental injury. But those provisions have raised many difficult questions for the medical profession. There is first the difficulty of definition. Not all diseases are occupational, even though they may be contracted by workers. The wording of the law varies greatly in different states. Generally speaking, an occupational disease is one that arises out of the nature of the employment and is due to conditions that are found generally therein. It must have its origin in an exposure that is common to the employment. It does not under the laws of most states include the diseases of ordinary life to which people generally are exposed regardless of the employment. The laws of some states have sought clarity by naming the definite diseases and the particular exposures out of which they are deemed to arise. Other laws have specified occupational disease coverage in broad general language, leaving largely to the administrative authorities and the courts the defining of the law in specific cases. This type of law, while affording broader coverage, imposes upon the physician a large responsibility in giving opinions as to what conditions come under it.

During the past generation, since the inception of the workmen's compensation law, many medical and surgical problems have arisen due to the concept that trauma or occupational disease may not only cause disease and death but could and at times does aggravate or accelerate underlying diseases.

In the aggravation of disease by injury, there remain many problems and questions that require research and study. To illustrate, such vexing medical problems as pain in the back as a result of strain have brought into focus the aggravation of an underlying silent osteoarthritis of the spine. Did or did not trauma aggravate or accelerate the pathological status of a pre-existing osteoarthritis of the spine? It is not uncommon to find on x-raying the abdomen that the vertebral column, which is brought into focus, is the site of an hypertrophic osteoarthritis which has been progressive and present for many years and, at times, quite marked though symptomless. The individual continues with his daily work and has no symptoms until a strain or injury causes "pain in the back." Osteoarthritis is of metabolic origin. Indirect trauma may cause back pain and the allegation is made that the disease was aggravated by strain.

This is but one of the multitude of questions that daily arise. We are faced with the necessity of considering the compensability of every kind of traumatic injury and every type of occupational disease, not only by itself, but in its relation to a host of complications and pre-existing conditions. We also must consider disease conditions that manifest themselves after injury. These may include diseases of a disturbed metabolism. infections of all kinds, including pulmonary tuberculosis, organic diseases, neurological disturbances, anemias, cancer, and many other illnesses, often unknown to the injured person prior to the injury. Perhaps the workman knew of some underlying condition but was able to earn full wages up to the time when he was injured. Or he may not have been aware of any underlying condition and had no reason to suspect it, and yet after injury the discovery of organic pathology may be made that demonstrably had long pre-existed the injury. Often the unrelated condition is one that requires treatment along with treatment for the disabling condition resulting from trauma if the man is to be restored to a working status. The doctor is bound to be faced with the question of causal relationship and whether the accidental injury has aggravated the pre-existing pathology to the extent that it prevents his again working or delays his return to work.

The implications of the compensation laws have emphasized the necessity for further study of the etiology of disease and the causation of disability that prevents men from working. To that end it is essential that there be established and accepted by the profession criteria for diagnosis and determination of causal relation and standards of disability. In the vast field of compensation medicine studies looking to the establishment of such criteria and standards will engage the interest of men outstanding in the various specialties. In the newly organized American Academy of Compensation Medicine* are men of outstanding attainments in their special lines. Committees are engaging in such studies in the fields of heart and lungs, internal medicine, neurology, general surgery and orthopedics, pathology, hematology and vascular diseases, dermatology and syphilology, roentgenology, to mention only a partial list.

These problems have long been recognized by the American Medical Association. Its Council on Industrial Health some years ago established a Committee on Workmen's Compensation which has given much study to the problems of compensation medicine and the problems of industrial medicine. The greater interest and emphasis, however, have been laid on the field of industrial medicine. That field is primarily devoted to the problems of disease prevention and industrial safety. In many respects the work of the industrial physician parallels the work of the physician in the field of public health. The importance of industrial medicine is recognized

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by all. To prevent accidents and to prevent disease is of the highest importance and greatest usefulness. The industrial doctor and the plant medical adviser perform a most important function in making reasonably safe and healthful the places where men have to work. It may not always be easy to delimit the field of industrial medicine and the field of compensation medicine. In general, however, the compensation doctor is called in only when an accident or an occupational disease has occurred or a claim is asserted. As has been indicated, his function arises in the case of a man who has sustained injury, his problems are the diagnosis, the causation, and the return of the man to work in the best possible condition in the shortest consistent time.

When a complicated case is at hand and troublesome questions arise, the injured man or the family physician, the employer or his insurance carrier, and the administrative authorities must turn to the specialist, the expert, for suggestions, for special procedures where indicated, and for informed and expert opinion and advice. To be fully informed, the specialist must have not only the opportunity of examination of the injured person, but he must have also the benefit of accurate records, of complete histories and of timely observations of all conditions which may relate to or have a possible effect upon the disability or its causation.

Thus it is evident that upon the doctor's medical knowledge and ability may depend the outcome as to whether or not a disabled worker is entitled to compensation benefits. From this observation was envisioned the necessity of a national forum of physicians devoted to discussion of compensation medical problems, as distinguished from the industrial hygienist who is primarily devoted to preventive medicine and the elimination of hazards both of accident and disease.

THE necessity of a national forum for the discussion of compensation medicine and the problems of establishing the recognized criteria for adjudging both occupational disease and the aggravation of pre-existing disease by accidental injury led to the formation of the American Academy of Compensation Medicine in 1947. Founded by a group of physicians and surgeons, qualified specialists in their respective fields, intensely interested, if not primarily engaged, in the problems of workmen's compensation, the objects of the Academy were set forth, among other things, to establish and elevate standards of practice and of ethics in this field, and to encourage, foster and promote improved organization and service in caring for the injured and ill in industry by means of study, research and education. The purposes were set high.

It is the plan of the members who joined in forming the Academy of Compensation Medicine to promote education and research in the field of compensation and industrial medicine. The undergraduate medical student receives little if any training in industrial medicine or in that branch of industrial medicine in which we are interested, namely, compensation medicine.

Recognizing the need of education and encouragement in the study of the problems of compensation medicine, and the contributions thereto of the older men who have had wide experience, the Academy has established two classes of membership, namely, Fellows and members. Any physician, in good standing in his County Medical Society, may apply for membership in the Academy. Fellowship is limited to physicians who are members of their county and state medical societies and the American Medical Association and who, in addition, are diplomates in a specialty or who have passed the Board examinations in their respective specialty or who are Fellows of the American College of Surgeons or the American College of Physicians. In the absence of these qualifications, Fellowship is granted to those who have special qualifications acceptable to the Board of Governors.

A further objective of the Academy is to aid and encourage the development of rehabilitation centers such as the one now conducted by Dr. Howard A. Rusk, at University and Bellevue in New York City. Rusk recently pointed out: "There are more than two million workers who suffer temporary disabilities from accident. Total work lost by these men in 1947 was 280 million man days, or the equivalent of one million men kept out of work continuously for more than one year."

The necessity for making the Academy a national body is self-evident. The physicians who have had special experience during the past quarter of a century or more, owe an obligation to the younger physicians and a moral obligation to society at large to publish the results of their experience and right judgment acquired in the course of their work in the past. There will be at least one or two meetings a year and all the scientific presentations will deal with problems in compensation medicine.

In November, 1948, the first symposium of the American Academy of Compensation Medicine was held at an afternoon and an evening session at the New York Academy of Medicine. Participating were not only outstanding physicians, but leaders in industry, labor, insurance, the bar and the judiciary. The subjects that were presented included problems of heart disease in compensation medicine, the effect and advances in control and treatment of the newer toxic agents, and compensation medical problems as seen by the dermatologist, the neurologist, the general surgeon and the orthopedist.

From the many expressions of opinion, one can readily say that the need for such a type of organization as an American Academy of Compensation Medicine is fully recognized.

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Personal Factors in Industrial Accidents
—A Study of Accident Proneness in an Industrial Group—

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ON SUPERFICIAL observation accidents appear to be the result of misfortune. The factors determining the man who will be struck by a falling object or will slip on grease on a floor appear to be determined by chance alone. This is definitely the major condition that determines the frequency with which industrial workers are injured in different types of occupation. The most obvious method of reducing accidents, therefore, is to take the steps that are necessary to reduce this basic risk by providing protective devices and by means of worker education as is carried out in every progressive industry. However, it has been repeatedly demonstrated that chance or risk of a specific occupation does not tell the whole story in accident causation. When a group of workers are studied to determine the frequency with which various members, working under similar risk situations, suffer from accidents, it is always found that there are a small number who have many more accidents than can be explained on the basis of pure chance. These men appear to possess certain personal characteristics which make them more liable to suffer from accidents than the average worker. To this group the term accident prone has been applied.

In this paper we wish to limit our discussion to this group. We have studied the accident records of a small factory and have interviewed a limited group of workers to determine if they could be identified either on the basis of their past history of accident or by the personal characteristics that have been shown to be associated with a high accident record. Our purpose was to attempt to assess the practicality of applying the extensive information that has accumulated on a research basis to the study of accidents in a group of workers.

Characteristics of Group Accident Records

A. ACCIDENT RECORDS BEYOND CHANCE: The existence of a group of individuals with a high accident experience not explainable by chance alone was first demonstrated by an analysis of past accidents. Although, in the initial demonstration, statistical procedures of marked complexity were required, this can be accomplished by a simple analysis of routine accident records. This approach still remains the simplest and most accurate method of identifying workers with a tendency toward repeated accidents. Fortunately this can be carried out by studying injuries of a trivial nature.

In 1919 Greenwood and Wood[5] reported the results of an analysis of the accidents suffered by workers in the British munition factories during the First Great War. When the frequency with which different persons working under the same basic risk suffered from accidents was compared with a number of theoretical possibilities it was found that the observed results only fitted the theoretical supposition that certain workers are for some reason or other more prone to have accidents than others. Since this original work this finding has been repeatedly confirmed.[6,8]

These studies are excellent examples of highly skilled, exhaustive analyses by trained statisticians. As such they demonstrate the role of the individual in accident causation. Many other studies have not shown the same exhaustive or as well-controlled approach as these original contributions. Rawson,[8] in a review on this subject, quotes studies with estimates of the importance of the group with high accidents varying from 0.8% of the workers causing 10% of the accidents to 10% causing 35%. Although many of these studies neglect two rather elementary statistical points,* they all emphasize the importance of small groups of workers with high accident records.

In our survey we were allowed to study the accident records of a large modern brewery.** From analysis of the accident rates in the various departments it was felt that the bottling depart-

This study was made possible by funds from the John McClary Memorial Fund.

*The statistical points are: (a) That even without any personal factor you will have a small group with high accidents, for example, if a group during a given period has an average accident rate of five there will still be some with 10 accidents on the basis of chance. Chance or luck will determine that there will be a wide spread in the frequency of accidents under the same conditions. The demonstration of the accident prone group is based on the demonstration that the number of workers with a high accident record is more frequent than explainable by simple chance. (b) That as pointed out by Rawson, if the number of accidents is less than the number of the employed group you will always have a figure where a certain percentage of workers cause 100% of the accidents, e.g., if you are dealing with 1000 workers and there are 500 accidents, and each worker involved has one accident, then 50% of the workers are responsible for 100% of the accidents. This of course would be meaningless.

**John Labatt and Company, London.

ment offered the best facilities for such a study. The accident rate here was roughly four times that of other divisions within the factory. The work involved the handling of bottles, and despite all protective devices there was ample opportunity for cuts of various severity from broken bottles, etc. Thus the bottling department fitted the requirements for a statistical study by having many minor accidents. Moreover, the relative basic risk per worker was relatively constant, so that there was little opportunity for making the obvious mistake of thinking a worker was accident prone when his high accident rate was due to only the fact that the work he was doing involved a higher risk than that of the others within the group.

In this plant accident prevention through protective devices, worker education, etc., has been fully stressed. The information concerning the frequency of accidents was obtained from small cards that were completed by personnel in the medical department when the injury was dressed. This record system has been in use in the factory for some time, and it represents the simple type of day-by-day record that would be kept in any factory with an adequate medical organization. Our contribution was limited to the analysis and interpretation of available information. We defined an accident in this study as any injury bringing the worker to the medical department for dressing. Since the men are encouraged to obtain immediate attention for even minor injuries the records include many trivial abrasions and cuts that would not be recorded in a less ideal setting.

The distribution of accidents among 290 men over a period of four weeks is shown in the following table:

ACCIDENT FREQUENCY IN A GROUP OF WORKERS

Accidents Per Man	MEN		ACCIDENTS	
	Number	% Total	Number	% Total
0—4	141	48.6	293	17.8
5—9	99	34.1	662	40.3
10—14	32	11.0	364	22.2
15—19	13	4.5	212	12.9
20 and over	5	1.7	111	6.8
Total	290	99.9	1642	100.0
Mean Accident Rate—5.7				

From this table it is seen that almost one-half of the workers have had less than five injuries during this period. Yet during this same interval five, or 1.7%, of the men had more than 20 injuries and account for 6.8% of the total calls at the medical department. A more detailed breakdown by individual accidents shows that the greatest number of men had one accident during this period.

The problem of determining at which level of accident frequency a worker can be considered as accident prone still remains. One simple method is to include 5% of workers with the highest rate for two successive periods, eliminating those who appear in one list only as being due to chance. This is sufficiently accurate for all practical purposes.

One method of determining the influence of the accident prone group on the average accident rate for the group is given by Newbold.[6] In her study she gives a table by which one can obtain the average accident rate that would be expected on the basis of chance by noting the proportion of the group that are accident free. In our group 7.6% of the workers had no accidents during the period recorded. Using this figure and referring to Newbold's table we find that the average number of accidents of the group would have been 2.6 if chance alone were responsible for the distribution rather than 5.7 as recorded. The higher record in the group studied is due to the presence of accident prone workers.

B. STABILITY OF ACCIDENT RECORDS: In studying the distribution of accidents in a group one must select a period of time and determine the picture during this period. This tells nothing of the long term record of accidents. Previous work would suggest that a high or low accident tendency is a fixed characteristic that remains the same over a prolonged period, and is not something that varies from time to time. Greenwood[5] studied a group of workers for two successive periods of five months. He found a high degree of correlation between the accident record of the same men in two successive periods. Those who showed a high accident record during the first period also had a high record during the second period and vice versa.

Our findings showed a similar tendency. By using the accident records for two four-week periods it was found that the 17 workers who had the highest accident record during the first period had 2.5 times as many accidents as a similar number of workers who had the lowest record during the first period.* This finding, when considered with the frequency of personal accidents noted in this group would suggest that the accident tendency is a lifelong characteristic, and it appears to invade all aspects of life. Those who have most accidents at work also have the greatest number of accidents away from work.

C. THE RELATION OF MAJOR AND MINOR ACCIDENTS: All statistical studies on accident proneness are carried out on records of minor mishaps. Major accidents do not happen frequently enough to allow statistical consideration. Few individuals live through many major mishaps to be available for any type of study. Yet from the point of view of prevention the major interest is in the factors concerned in the more serious injuries. Therefore it is important that we know something of the relationship between the frequency of major and minor accidents. In a British study[4] of the accident records of 14,000

*Greenwood found a positive correlation of 0.67+.03 for the accident records in the two periods. Our correlation was slightly lower at 0.56+.09.

workers it was shown that the group who have the most frequent minor accidents also have an undue proportion of major accidents. As Osborne[7] has pointed out, the extent of the injury is determined almost entirely by the circumstances present at the time of the mishap and is the one pure chance happening.

The Personality Factor in Accident Causation

ALTHOUGH a statistical study clearly identifies the accident prone individual on the basis of his accident pattern it offers little in the way of explanation of the factors responsible for these tendencies. To obtain this information we must study the details of the individual's personality.

Many accidents, when analyzed in retrospect, are happenings which should never have taken place. They are seen frequently to result from errors in judgment or from thoughtlessness. Forester,[3] in a study of mental attitudes and their relationship to accidents, came to the conclusion that 90% of accidents were the result of faulty behaviour on the part of the worker, and that roughly 14% of the accident prone individuals showed evidence of being maladjusted in their work. They were the individuals who showed most frequent errors in their work, had the poorest attendance, and were vocational misfits given to inattention and worry and demonstrating unwillingness to accept supervision. Bannister,[1] in a study of 54 accidents, noted that roughly two-thirds were the result of individual factors, and he stressed the importance of foolhardiness, foolishness in the sense of being impulsive and not stopping to think, distraction, hurry, annoyance, anger, worry, etc. He found that 25% of accidents were the result of hurry, annoyance and recklessness.

Many other studies of a similar nature have been carried out. However, the use of popular ill-defined terms and the failure to consider that these are characteristics which anyone may show at times make them findings that are difficult to evaluate, and to correlate with the statistical information derived on the mass study of accidents.

In this field the work of Dunbar[2] is undoubtedly the most analytical and her findings are in keeping with the previous information obtained in the mass statistical studies. Her approach differed from those mentioned previously in that she concentrated on the life-long personality of the individuals rather than the type of immediate personality reaction which was associated with an accident. The individuals studied were fracture patients in the hospital. She noted that as a group 80% of these patients suffered from an accident syndrome which was closely related to a specific manner of handling anxiety. Essentially these patients were individuals who as children left home or were orphaned early. They had frequent neurotic traits of the aggressive type such as lying, stealing, truancy, etc., and there were many childhood accidents. The marriage rate was average but marked by sexual irresponsibility, few children and a high divorce rate. They showed lack of planning and interrupted their education in the middle of a unit such as public or high school, and changed jobs frequently. Essentially the picture was that of a superficial self-centered individual who acted impulsively with little thought of the result of his action and little concern for the welfare of others; who was in conflict with the limitations set by authority in his home and social custom in school, and subsequently in marriage and in work. Dunbar believed that this group differed sufficiently in their personality pattern that they could be identified on this basis alone without a study of their accident record.

In this study we have attempted to determine if the personality characteristics as noted by Dunbar in a hospital group were to be found in the high accident group in industry. We made no attempt to identify the high accident group on the basis of the interview and personal history alone. It readily became apparent that, although we had a great deal more available time than the average industrial physician, such an approach was impractical. The small group of high accident individuals was masked by a much larger number of workers with low or average accident tendencies. Although the extreme example of an accident prone person was readily recognized there were few in number and the job of separating them on this basis became overwhelming. Dunbar was working on a selected group when she believed that they could be so identified. Therefore, we identified the 17 members among the 290 members of Group A who had a persistently high accident record during two separate time periods. They were compared with a similar number of workers having a low accident record during this period. The two groups were of approximately the same age distribution. These two groups, composed of 34 men in all, were interviewed. A history was obtained covering the family background, childhood and school history, and subsequent adult adjustment on the social, occupational and work adjustment level, in order to identify the factors emphasized by Dunbar. Although the interview was voluntary none of the men refused to give the information required. This was carried out during working hours, and since both high and low groups were considered, this procedure was possible without the worker losing face with his fellow employees. Roughly one hour was spent with each man. We were not known to the employees, therefore a considerable period was required in establishing rapport. The results of this are shown graphically in Fig. 1.

Here we have recorded the important features in the life history showing each positive finding by a black dot. Wherever possible this history was confirmed by checking the information with the agency concerned. Many of these were objective measurements such as Juvenile Court contact, etc. It is seen that these two groups differ markedly. In the high accident group 14

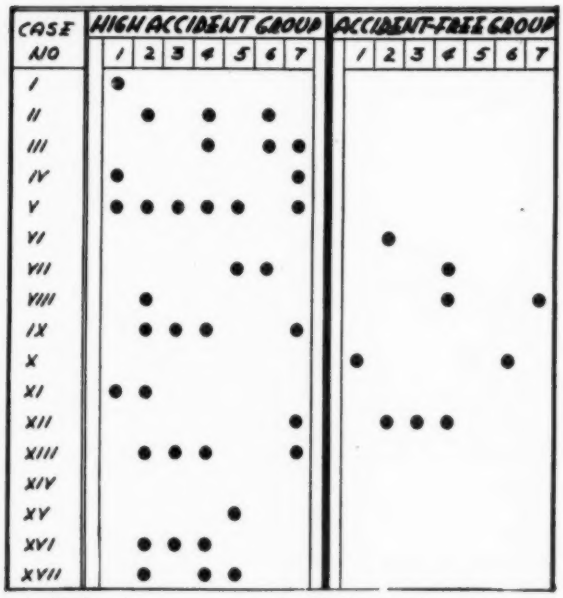

Fig. 1.
Social Background, High and Low Accident Groups, Industrial Workers

of the 17 have a positive history in contrast to five members of the low accident group. The difference in the two groups becomes more marked when we consider the frequency with which the characteristics appear in the individual. In the accident free group, only one individual is positive on three factors and none has more than this. In the high accident group seven members have a positive history on three or more points and one man is positive on six of the seven factors noted.

Thus it would appear that the high and low accident individuals differ markedly as a group in their social adjustment, the high accident worker coming most frequently from a broken home and having evidence of conflict with authority in both childhood and adulthood as revealed by truancy at school, contact with the Juvenile Court, irregular work history and history of being fired, and a record of marital discord and contact with social agencies. The low accident worker, on the other hand, rarely showed difficulties of this nature in his life history. The aggressiveness that led to difficulties in their personal life is the same factor that leads to a high accident record at work.

Summary

THE ACCIDENT prone worker can be identified by a simple analysis of the frequency of occurrence of superficial injuries.

2. This tendency towards accidents appears to be a stable characteristic.

3. Those who have the most frequent minor accidents have a disproportionate number of major accidents.

4. The personal history of the high accident group differs from the low by being marked by evidence of aggression and intolerance for family, social or work discipline.

Conclusions

IT IS OUR belief that accident proneness is not a subject of limited academic interest, but is a concept of importance to the industrial physician who wishes to take an active part in accident prevention. If a physician takes an active part in selection then the taking of a more detailed personal history will reveal the more extreme examples of this group. This would require little more than a superficial knowledge of the characteristics of this condition. If a personal interview is not routine practice then it would not appear reasonable to introduce it for the purpose of recognition of this syndrome unless the individual is being hired for a job that leaves him open to the possibility of severe injury to himself or the possibility of injury to someone else. In the employed group the individual accident records can be maintained in such a manner that any exceptionally high accident experience becomes apparent if these records are analyzed. A high accident record should be followed by a life history to determine the lifelong pattern of reaction and accident record. If it is determined that a worker is accident prone to a marked degree, then there is little to offer other than a transfer to a less dangerous occupation. Certainly the evidence would suggest that the basic cause is to be found in the life-long pattern of emotional reaction that is uninfluenced by reason or education.

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Basis of Approvals of Medical Services in Industry

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FUNDAMENTALLY, approvals of medical services in industry by the American College of Surgeons are based on the acceptance and maintenance of the provisions of the Minimum Standard.

The question may arise "How did the Minimum Standard come about?" Originally, the need for better organization and service in caring for the ill and injured in industry, for the elimination or control of industrial health hazards, and for the institution of other health preservation measures was long recognized. In 1926, the American College of Surgeons, with its own committee in cooperation with the medical personnel of industries and insurance companies, appointed a committee to study and work out ways and means of improving this situation. Following this, the College sponsored extensive surveys of industrial medical services at selected points in the United States. These surveys were fact finding in character. Based upon the findings of these personal investigations, the so-called Minimum Standard was born, the provisions of which, briefly, are as follows:

1. There shall be an organized medical department with competent personnel.
2. The medical staff and consultants shall be restricted to qualified physicians.
3. Medical records shall be adequately maintained and filed in the medical department.
4. Approved hospitals shall be used for hospitalization of ill or injured.
5. Matters pertaining to general health of employees and plant sanitation shall be under the supervision of the medical department.

These five clauses really represent only the framework about which appraisals of medical services are finally made.

IN STARTING out a fact-finding routine, we generally begin with the subject of "use of first aid kits." Most industries having a medical department have long discontinued their use. A long dissertation on this subject could ensue, which shall not be dwelt upon, other than to state that sometimes there are good and useful indications for their use while, on the other hand, their use should not be resorted to. During the war years, it was amazing to see the extent of emergency kit placements in widely scattered parts of the plants. However, these were not kits as we know them but trunks, boxes, and cabinets—in fact, the makings of miniature emergency dispensaries.

The observation is made as to whether or not written standing orders have been provided by the physician in charge. I personally call these "the nurse's industrial bible." They definitely serve a purpose, primarily as a reference guide for the dispensary attendants. They also protect not only the nurse but the industry as well.

Next, the means of transportation, both locally and without, are ascertained. This merely involves available stretchers, wheel stretchers, wheel chairs, autos, taxis, or ambulances as necessary.

The complete personnel of the medical department is discussed. Is the doctor full-time, or part-time; and if the latter, how much, or is he employed on a call basis only? Do the doctors comply with Clause 2 of the Standard which has to do with qualifications. This is further ascertained by resorting to well-known, authorized sources. Industrial staffs with any irregular practitioners, as you well know, would not be highly regarded but have been found to exist.

It is also desirable to obtain a list of consulting physicians and surgeons used, designating the specialty of each, such as the surgical specialties, eye, skin, x-ray, etc.

The names of hospitals used for hospitalizing industrial cases are obtained. Clause 4 of the Standard is specific in stating that approved hospitals shall be used. Were I personally the sole judge and jury in regard to an approval of a high class industrial medical service having no alternative than to use an unapproved hospital, I would be tempted to rule favorably for the time being, unless without question the hospital was beyond the possibility of meeting hospital standards. Under such continued circumstances, would it be a desirable institution for the best welfare of its patients? This is the attitude which the American College of Surgeons takes, and rightfully so.

The subjects of pre-placement and periodic examinations are next in order. These include inspections of the completed forms. I think it appropriate to comment upon some observations made. These examinations, to be respected, should be done by none other than qualified physicians, but now and then dispensary attendants' examinations are performed and accepted by the industry.

Some examination forms are incompletely filled in, such as the recording of only the positive findings; otherwise the form remains blank. Now and then, the examining physician's name does not appear.

The majority of examinations will include blood pressure but not urinalysis or blood serology as a routine practice. Routine chest x-rays have been running about 20% in late years.

Presented at the Thirty-Fourth Annual Meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, Detroit, April 6, 1949.

In regard to filing these records, I am quite sure it is agreed that since these examinations represent confidential information between doctor and employee, they should be filed only in the medical department under strict medical supervision. However, it is not uncommonly observed that these records are filed either in the personnel or employment departments. From the standpoint of these latter departments, this practice could easily be eliminated by the use of an appropriate code or rating form submitted to the placement officer. This practice has long been adopted in many plants.

As for periodic health examinations, the practice runs a varied course, ranging from annuals to biennials for all employees, on down to special groups only, and still on down to none. Our statistics show that during the present decade, as compared with the preceding one, there has been about a 40% increase in periodic examinations for all employees but approximately a 100% increase in periodics for special groups. Thus there appears to be a growing appreciation of the value of such procedures. Might the practice of periodic health examinations be likened to the proverbial "ounce of prevention" or "stitch in time?"

We are always interested in the type or types of occupational disease hazards peculiar to the nature of the industry at hand. We do not profess to be chemists or engineers, but all of us who have had close professional association with industry have an appreciable knowledge of not only the possible existence of these hazards, but also of their elimination or control. It must be conceded, however, that a challenge does present itself not infrequently as the wheels of progress unfold new and potent products. Industry is constantly aware of these dangers and is making every effort to keep them well in hand.

While visiting medical services, we take note of the nature and extent of non-industrial services made available to employees. The extent of these particular services by the overwhelming majority of medical departments has been found to be entirely ethical in scope. The purpose and license of industry is not to practice medicine. If for no other reason than a sense of fair play, industry should go no further than to give reasonable first aid and treatment to those on duty. Reasonable non-industrial medical service offers its advantages. It permits the worker to remain on the job. It promotes goodwill between the medical department, management, and labor. For these minor non-industrial conditions, the outside practitioner is not deprived of patients, as these employees would not stop work and accept a wage loss to go to him.

There is only one point I would suggest and that is that careful scrutiny be given cases in which non-industrial services are extended in order to avoid the possible criticism of interfering with the practice of physicians of the community.

For general information, the nature and extent of special preventive or prophylactic medical measures are noted. This is relative to the use of salt tablets, skin creams, athlete's foot prevention, oral and parenteral cold vaccines, vitamins, and other immunization programs, etc. Then, general information is noted in reference to there being any organized health education program for employees. As you know, much has been spoken and written on this subject. I think it can be rightfully stated that, with the exception of very few instances, this program of in-plant health education is one of the weakest links in industrial medical services.

In comparatively recent years, eye survey services have crept into some industries particularly with regard to visual acuity. You are as familiar with the existence of this practice as I. It is a commendable service when operated by qualified ophthalmologists but, unfortunately, in most instances such is not the case. In order to interpret eye findings in relation to possible systemic disease, only physicians qualified as specialists are competent to make these examinations. An approval of more than one medical service has been held in abeyance which in all other respects was excellent except for the character of its eye service program.

As previously stated, Clause 5 of the Minimum Standard has reference to the medical department's having supervision over general health measures and plant sanitation. In the majority of plants, the physician is the only individual qualified to assume this responsibility. A physician in industry who does not religiously include this as one of his responsibilities is shortchanging both the employer and the employee. In many instances, management is at fault for this situation since it has failed to delegate such duties to the physician in charge.

PERIODIC plant inspections by the doctor serve many purposes:

1. He becomes acquainted with the various operational procedures, thus being much better qualified to make proper placements.
2. He has the opportunity to observe and evaluate working conditions from a health standpoint.
3. He can note and make recommendations as to general plant sanitation in all departments.
4. His interest in all these general conditions will tend to make a favorable impression on the workers, for in their minds is created a greater respect for and appreciation of the value of the medical service afforded them.

I have experienced instances where, in casually going through plants with the doctor, it was almost impossible to carry on a conversation owing to the frequencies of "Hi, Doc," and "Hello, Jim." In this plant, the doctor knows everybody and his job and everybody knows him.

Just as a matter of general information, employee benefits are noted. This has reference to employees' mutual benefit associations; group insurance plans; hospitalization plans, which may include surgical and medical benefits; and, finally, pension, retirement, or annuity plans.

MEDICAL SERVICE IN INDUSTRY
AMERICAN COLLEGE OF SURGEONS
COMPARISONS BETWEEN 1930-1940 AND 1941-1948

		1931-1940	1941-1948	Percentage increase or decrease
Number of companies		1570	570	
Physicians	Full time	24%	28%	4%
	Part time	43	56	13
	On call only	33	16	17 *decrease*
Nurses		64	96	32
Pre-placement physical examinations	Routine	64	85	21
	Special groups	8	10	2
	None	28	5	23 *decrease*
Routine blood serology		2	49	47
Periodic health examinations	Routine	17	24	7
	Special groups	24	50	26
	None	59	26	33 *decrease*
Medical supervision, health, and sanitation		38	65	27
Use of approved hospitals		86	95	9
Approved or provisionally approved medical services		57%	77%	20%

HAVING completed this rather round-table session, the remaining time is devoted to the dispensary. Its location and size are observed, as is the general appearance in reference to cleanliness, orderliness, light, ventilation, and noise. Needless to say, equipment is observed and noted.

Lastly, comes the inspection of the complete record system. The physical examination record has previously been mentioned. There is a wide diversification in maintaining dispensary records, some of which are excellent. Some may be brief but adequate, while others are not. Perhaps it is apropos to mention a few examples of inadequate and non-informative recordings.

Some dispensaries make no records of non-industrial cases receiving service. Some record only the treatment, omitting the complaint; others the complaint, but not the treatment. Even some of the minor types of plant injuries are not recorded. Some are recorded, such as the following: "burn on the leg," "cut finger," "contusion of foot," "foreign body in eye," and other like anatomically inaccurately described injuries.

More serious types of injuries have been found to be adequately recorded, as would be expected.

The minimum requirement for initially recording injuries should be proper identification, cause, nature, treatment, and disposition, and for non-industrial cases, identification, complaint, treatment, and disposition.

Monthly dispensary statistical reports should be maintained. Within a year's time, the 12 monthly reports, when combined, provide the yearly report. This should include the frequency and severity rates, as well as the totals of injuries, lost time injuries, days lost, hospitalized cases with their duration, and non-industrial cases including those with absences. This is the only means by which studies of absenteeism can be made.

Such summaries, when compared from year to year, will aid in evaluating the relative efficiency of the medical and safety services.

At some time subsequent to a survey, designated plant personnel receive a summary of the report on the facilities and over-all program of the medical service as ascertained and observed, which includes conclusions and recommendations as may be indicated.

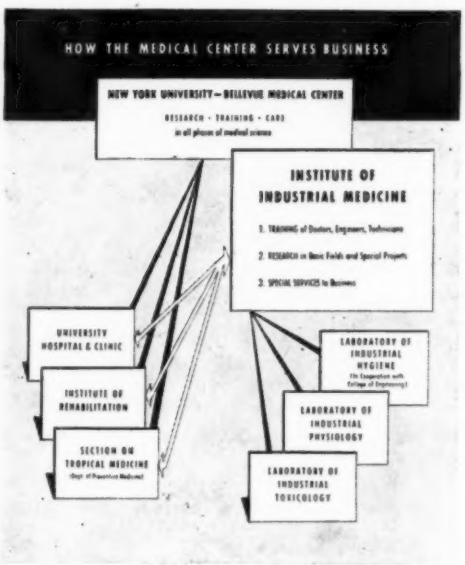
The official rating of approved medical services in industry is made once annually near the close of the current year at which time the year's work of the College is reviewed by the governing body. Following this, the new list of all approved medical services is published.

The College, in its endeavors to assist in elevating the standards for medical service, appreciates the excellent cooperation received from the physicians in industry and from the industries which have contributed so much to the progress of industrial medicine.

(40 East Erie St., Chicago 11)

Dr. Lanza's Institute of Industrial Medicine

NEW YORK University-Bellevue Medical Center has a comprehensive program of research, training and care in all phases of medical science. The Center's objective is more than an attack on isolated diseases—it seeks to raise the health level of each adult and child. Toward this end it is conducting research in such basic fields as heart disease, mental health, chronic diseases, nutrition and others.


HOW THE MEDICAL CENTER SERVES BUSINESS
NEW YORK UNIVERSITY—BELLEVUE MEDICAL CENTER
INSTITUTE OF INDUSTRIAL MEDICINE
UNIVERSITY HOSPITAL & CLINIC
INSTITUTE OF REHABILITATION
SECTION ON TROPICAL MEDICINE
LABORATORY OF INDUSTRIAL HYGIENE
LABORATORY OF INDUSTRIAL PHYSIOLOGY
LABORATORY OF INDUSTRIAL TOXICOLOGY

The Institute of Industrial Medicine, with DR. ANTHONY J. LANZA, Professor of Industrial Medicine, Department of Preventive Medicine, as Chairman, has been set up as a unit of the Medical Center in order to extend the effectiveness of the Center's work in the field of preventive medicine, particularly as it relates to employed persons. In addition:

1. With the cooperation of the Center's College of Medicine (for undergraduate doctors), the School of Post-Graduate Medicine (for practicing physicians), and the New York University College of Engineering, the Institute has now under way a pioneering program of training specialized personnel qualified to deal with problems of industrial hygiene—this includes doctors, research technicians, nurses and engineers.

2. The Institute has inaugurated a broad research program in industrial toxicology, the general results of which are available to industrial concerns. It is prepared to undertake specific projects under contract.

3. Through the Medical Center's clinic facilities, the Institute can make available to individual firms certain specific health services for their employees.

4. The hospitalization of especially difficult industrial cases can be handled through the Center's University Hospital, where a medical staff, trained in this field, is available.

5. The Institute maintains consultation and advisory services for individual business firms wishing to have studies made relative to the health conditions of their employees.

6. Through the Medical Center's Institute of Rehabilitation, there is offered to business firms opportunity to call upon top-flight personnel in the care of the disabled.

7. Through the Section for Tropical Medicine of the Department of Preventive Medicine, the Institute can make available special services to business firms having problems in this field.

The Medical Advisory Committee of the Institute, under the Chairmanship of DR. LANZA, includes:

DR. JAMES M. CARLISLE, Medical Director, Merck & Company, Rahway, New Jersey.

DR. A. G. CRANCH, Medical Consultant, Union Carbide & Carbon Corporation.

DR. DAVID GOLDSTEIN, Medical Director, New York Times Company.

DR. WILLARD MACHLE, Consultant.

DR. MELVIN N. NEWQUIST, Medical Director, The Texas Company.

DR. KENNETH PEACOCK, Medical Director, Habirshaw Wire & Cable Co.

DR. LEO PRICE, Medical Director, Union Health Center, I.L.G.W.U.

DR. ROBERT COLLIER PAGE, General Medical Director, Standard Oil Company (N.J.).

DR. JOHN J. WITTMER, Assistant Vice-President, Consolidated Edison Company of New York.

DR. HENRY E. MELENEY, Professor of Preventive Medicine, New York University College of Medicine.

DR. NORTON NELSON, Director of the Institute's Laboratory of Industrial Toxicology.

DR. EDWARD D. PALMES, Assistant Professor of Preventive Medicine (Industrial Medicine). New York University College of Medicine.

As an initial research unit of the Institute, the Laboratory of Industrial Toxicology, established in 1948, is currently undertaking for several prominent New York firms a series of related research projects concerned with the general toxic hazards of specific chemicals, or processes. It is also conducting a number of research studies in the field of skin disorders as they are related to industrial products and techniques. The laboratory is under the direction of DR. NORTON NELSON (PH.D., 1938, University of Cincinnati) who is also Associate Professor of Preventive Medicine (Industrial Medicine), New York University College of Medicine.

The Institute inaugurated this spring a course in "Medicine in Industry" for third-year students at the New York University College of Medicine. Extending over a period of 12 weeks, the course includes lectures in dust diseases, lead, solvents, dermatoses, psychiatry in industry, applied physiology of respiration as applied to dust diseases, organization and administration of industrial medical departments, physical factors in the industrial environment, the role of research and physical examinations.

Industrial Health Conference

—Proceedings of the Annual Meetings of Various Industrial Professional Associations, at Detroit, Michigan, April 2-9, 1949—

Reported by

C. O. SAPPINGTON, M.D., DR. P.H.

WITH better attendance than formerly, and a greater variety of subjects and features, the industrial professional associations held their annual Industrial Health Conference at Detroit, at the Hotels Book-Cadillac and Statler, April 2-9, 1949, this including the thirty-fourth annual meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS; the eleventh of the AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS; the tenth of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION; the seventh of the AMERICAN ASSOCIATION OF INDUSTRIAL NURSES, INC., and the sixth of the AMERICAN ASSOCIATION OF INDUSTRIAL DENTISTS. Among the features at this Conference were the Section Meetings: on General Manufacturing; on Steel and Heavy Industry; on Petroleum, Rubber and Chemicals; and on the Mining Industry. Also featured were the plant inspections and tours, especially arranged by and for the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS and the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION. The technical exhibits were considerable in number and great in variety and were well visited and inspected by the delegates. Other organizations also holding meetings during the week were the General Motors Medical Conference; the Texaco Annual Medical Conference, and the Conference of the Industrial Health Personnel of the U.S. Navy.

One of the outstanding and unusual features was the recognition of the Founders' group of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS with a special suite set apart for their use in the Book-Cadillac Hotel and photographs and special recognition on the evening of the Annual Dinner, Thursday, April 7, 1949.

Guests of honor included DR. W. B. PATTERSON, President, TERRITORIAL ASSOCIATION OF PLANTATION PHYSICIANS, Puunene, Maui, T.H.; TREVOR LLOYD DAVIES, M.D., (Lond.), M.R.C.P. (Lond.), Chief Medical Officer, Boots Pure Drug Co. Ltd., Nottingham, England; J. G. BILLINGTON, M.D., Birmingham, England; and H. G. S. VAN RAALTE, M.D., Chief Medical Officer, N.V. Curacaosche Petroleum Industrie Maatschappij, Emmastad, Curacao, N.W.I.

American Conference of Governmental Industrial Hygienists

April 2, Morning Session

THE morning sessions included four groups which met simultaneously and separately: the chemists, with DR. H. H. SCHRENK and DR. R. E. MOSER as chairmen; the engineers with MR. C. D. YAFFE and MR. J. C. SOET as chairmen; the nurses with MISS F. RUTH KAHL and MRS. VERONICA DONNELLY as chairmen; and the physicians with DR. HARRY HEIMANN and DR. L. W. SPOLYAR as chairmen.

At the physicians' round table, subjects were discussed as follows:

With respect to air pollution, we need to define the difference between hazard and nuisance. Involved is the concept of health and its definition and one must, of course, include odors, irritants, noises and other factors. We have to consider the psychosomatic aspects of the effects of air pollution —the psychosomatic aspects are a part of health.

As to pesticides which have been formerly classed as disinfectants, fungicides, agricultural poisons, insecticides, etc., DR. FARNER, of the State of Washington, has had considerable experience with these, and reference was made to six or seven papers. Of a group of apple workers, 156 showed abnormal findings, such as in the urine, colic, and other symptoms. The economic side of this problem is important since the farmers are now saving 50 cents a box on apples by using various types of sprays, and this, of course, is a very important factor to take into consideration. A study made of different groups has shown the dangers and the necessity for a health program, particularly a preventive one.

With regard to compounds, some of the new phosphates are presenting difficulties, through their use in dusting and spraying. Some of those particularly mentioned and discussed were tetraethylpyrophosphate which is known as TEPP, and parathion. The pressure seems to be on the economic side and, because of this, the health angles have been overlooked in many instances. Abrams has made a study in California concerning blood cholinesterates; he has quoted Bradley regarding some new sampling methods. DR. TOWNSEND, of the U.S. Public Health Service, says that this organization will probably do a number of studies. Better health education is necessary, with a reasonable amount of research which will be a guiding factor. Chlordane has been found to be toxic and produces skin lesions. Only the so-called resistoflex is practical in working with this compound because it acts as a solvent of neoprene. Abrams has shown the relation between the agricultural and food and drug groups in California for cooperation with regard to the principle of protection for the men using the materials. The Association of Economic Poisoning Officials of Washington and the U.S. Department of Agriculture were mentioned as agencies which could supply information. It was noted that there is some evidence available on the cumulative effect of DDT which appears to be stored in fatty tissues and then released later to cause systemic disturbances, in which there are acute attacks which are rather severe. It was stated that the respiratory tract and the skin could be protected when handling these compounds, in the usual way.

There were discussions of health and medical services for employees, particularly with reference to the unions and labor groups supplying the stimulus. A number of illustrations of this type of service were discussed. Reference was made particularly to DR. PETRIE'S experience in Georgia, and to a preliminary survey recently in Alton, Illinois, with respect to a pre-payment plan of medical care which was studied by the U.S. Public Health Service and the Industrial Hygiene Division of the State Department of Health of Illinois as to what could

be done regarding medical care. There appeared to be differences of opinion among those present as to whether these services should be rendered on a consulting basis only, in an advisory way, or on a participatory basis.

April 3, Afternoon Session

THIS session was a seminar round-up and open forum in which the chairmen of the round table discussions of the chemists, engineers, nurses, and physicians gave resumes of their sessions.

DR. H. H. SCHRENK reported on the chemists' round table. We still have old problems in spite of new methods and materials. There was discussion of free silica determinations, particularly with reference to x-ray diffraction methods, and concerning spot urine samples for lead, on which there was no definite agreement. Discussions also included various types of commercial instruments and the difficulties of sampling the oxides of nitrogen. Apparently there was not a great deal of interest in the methods of dust determination, since these "drew no fire." It was agreed that detectors are really important with respect to atmospheric contamination, and that there are complex present-day problems in getting simple devices. The subject of atmospheric pollution of communities was found to be very complex; it was agreed there is a lot to learn. There was some discussion of radiation problems.

MR. J. C. SOET reported on the engineers' round table discussions. Some 46 questions had been selected before the meeting and persons who had had experience with the material of these questions were selected to talk about them. Among these were problems in asphyxiation, instrumentation, atmospheric pollution, noise, insecticides, radiation, and solvents. From certain experiences, the suggestion was made that the aldehydes should be studied, as well as carbon monoxide, regarding asphyxiation problems.

MRS. VERONICA DONNELLY reported on the nurses' round table discussion. This included common problems in industry and commerce. Small plant experiences in Georgia and California were detailed. It was found that plans for one community are not applicable to others with regard to different types of industrial health problems. It was also demonstrated that there is a need for over-all qualifications for nurses on a national level.

DR. L. W. SPOLYAR reported on the physicians' round table discussions. As to air pollution, it was found that one had to define health and the toxic elements concerned. Any conception of health should include well being. Probably there is need for a re-evaluation of the toxicity of air contaminants on a 24-hour basis of exposure.

With regard to economic insecticides or pesticides, the changes in compounds occur rather rapidly and present difficulties—sales promotion methods and economic savings put such compounds into practical use before toxic data can be procured in some instances. Discussions also centered around DDT and the storage of this compound in the fat of the body, which appears to give some difficulty.

Problems of breathing diatomaceous earths were also posed, particularly with reference to high silica content. Apparently there is not enough experience on these to make any definite decision, although there is some evidence that exposure produces difficulties which may lead to pneumothorax, as well as to other pathology.

Medical care problems, particularly with reference to consultation work and participation, were also included.

With respect to carcinogenic substances, statistics are meager, but it is known that investigations are now going on in New York, Pennsylvania, and Ohio, as well as some other states.

Finally, metallic drosses which have the possibility of creating arsine were discussed in reference to recent experiences—such drosses should always be roasted before they are allowed to pass into other locations for handling.

Monday, April 4, Morning Session

MR. LOUIS F. GARBER presented the subject of "Health of Workers Exposed to Galena." At the invitation of one of the major lead producers, arrangements were completed in 1947 to conduct a study to determine the effects of exposure to galena on a selected group of employees. As finally arranged, the study covered 16 men handling galena in four different mills, and included observations during both winter and summer months. Atmospheric samples collected over a five-day period during the summer and a six-day period during the winter were averaged to obtain a daily weighted exposure to galena. These values expressed as milligrams of lead per 10 cubic meters of air were:

	Mill A		Mill B		Mill C		Mill D	
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Gravity	11.42	14.44			2.88	4.89	8.67	8.82
Flotation	18.95	33.66	80.42	42.57	69.01	46.43	39.94	23.41

Physical examinations of the 16 workmen involved in the study were made in July, 1947, and February, 1948. In addition to the usual routine medical examinations and laboratory procedures, special emphasis was placed on items such as occupational history, symptoms and physical findings suggestive of lead intoxication, laboratory examination for urine and blood levels, stippled cell counts and basophilic aggregation tests. A single specimen of blood was obtained as a part of each physical examination. Daily urine samples were collected from each man at the close of the work shift during both periods. There was virtually nothing in the histories, physical examinations, or routine laboratory studies to suggest lead intoxication. Red blood counts, hemoglobin determinations, stippled cells and basophilic aggregation tests were within normal limits during both periods. During the summer study, a five-day average urine lead level of two of the men exceeded 0.15 mg. pb./L, and one of these was in the group of two men with excessive values during the summer study. One man was reported as having a blood lead level in excess of 0.07 mg./100 gms., and he was not one of the two men so reported during the summer study. There was no apparent relationship between blood and urine lead findings and other symptomatology. In summary, atmospheric samples collected over periods of five days during a summer season and six days during the winter established weighted exposures to lead sulfide varying from approximately two to 50 times the generally accepted safe limit of 1.5 mgs. lead per 10 cubic meters of air. Physical examinations

of 16 workmen exposed to these concentrations did not reveal symptomatology indicative of lead poisoning. Stippled cell counts and basophilic aggregation tests were within normal limits. Examination of blood and urine for lead content gave in a few cases the only indication of lead intoxication. However, these occasional high values unsubstantiated by clinical evidence are felt to have little weight in establishing a case of lead poisoning.

MISS WINIFRED DEVLIN, R.N., presented a paper on "Industrial Nursing Consultant—Where Is She Going?" The most immediate problem in nursing today is one of shortages in personnel, both in supply and in qualifications. We now have approximately 280,500 actively engaged professional nurses registered in the United States. It is estimated that by 1960 we shall need twice as many to maintain current standards in nursing service. In spite of the vigorous recruitment campaigns that are being carried on, it is doubtful whether we shall be able to recruit the enormous supply of nurses needed. The rapid advances made in medical research, and the extension of medical care and health services to larger segments of the population call for not only a greater supply of nurses but also for a high degree of competency in nursing. There is an acute need to revamp the entire structure of basic nursing education. The inability to switch from an apprenticeship system of training to a system of sound professional education is one, if not the major, cause of our present crisis in nursing. It has had a profound effect upon the development of industrial nursing service and the function of nursing consultant service. It is even questionable whether nursing consultant service can function to any great extent until the immediate problem in nursing education becomes resolved. This has been recognized in nursing, and a vigorous movement is under way to revise nursing education so that the basic nursing curriculum in collegiate and university schools of nursing, in hospital schools of nursing and in the schools of practical nursing will provide the nurse of tomorrow with the knowledge, understanding, skills and attitudes necessary for competency in the fields of employment rapidly developing for her. A committee appointed to study and determine what can be done to meet the present shortages in nursing has made proposals for the future. It suggests that:

1. The nursing function be divided between professional and practical nurses.

2. A goal of 600,000 nurses be established by 1960, 200,000 of whom should be college graduates designated as professional nurses, while the remaining 400,000 should be practical nurses who have completed a 9-12 month program in an approved school for practical nursing.

3. Conditions of work and salary schedules be improved.

4. Opportunities for research in nursing be studied.

What are the implications of these proposals for the industrial nursing consultant? Five seem apparent. They are:

1. That the consultant will fall within the category of the professional nurse.

2. That the supply of consultants should increase to some extent. The length of time they will remain essential will depend upon the rapidity with which an adequate supply of competent staff administrators, supervisors, and teachers becomes available. The supply of consultants will decrease in direct ratio to the nursing qualifications in all levels of positions. A certain number will always be essential to assist with the application of new knowledge and new techniques.

3. That the two most immediately important tasks of the nursing consultant are to explore and use desirable opportunities for developing in-service training programs, and for strengthening basic and advanced professional curricula.

4. That the scope of nursing consultant responsibilities should be an important criterion in developing advanced professional curricula, and adequate salaries.

5. That health departments should decide, as quickly as possible, where the emphasis should be in consultant service in their own respective states, and local areas; and that when a decision has been reached, all available resources should be channeled toward providing consultants with the equipment they need to do a competent job, a vitalized program of continuous in-service training, a degree of prestige that will reflect the essentiality of consultant service, and financial remuneration commensurate with responsibility, accompanied by the opportunity to achieve worthwhile goals.

Monday, April 4, Afternoon Session

MR. L. B. BERGER discussed "Aldehydes in Diesel Engine Exhaust Gas." This paper presented a brief discussion of the reaction mechanism by which aldehydes are produced in the combustion of fuel in a Diesel engine, and outlined several factors that influence the formation of aldehydes present in the exhaust gases of this type of engine. The identities of the aldehydes and other minor constituents of the exhaust gas also were discussed. Analytical methods that may be used to determine the aldehyde content of Diesel exhaust, or other gaseous mixtures, were reviewed. The significance of the odor and irritating properties of aldehydes in mine atmospheres, or in other environments, was noted, as were methods studied or developed for the removal of aldehydes from Diesel exhaust gas.

DR. W. G. FREDRICK talked on "Health Problems of Fluoroscopic Shoe Fitting Machines." The increasing use of x-ray fluoroscopic shoe fitting machines has resulted in a large group of Detroit workers being exposed to the potential hazards of ionizing radiation. An investigation was undertaken by the Detroit Bureau of Industrial Hygiene to evaluate these hazards and devise means of controlling them. X-ray shoe fitting machines consist of five functional parts: an x-ray tube, a fluorescent screen, a transformer, a timing mechanism, and a starting mechanism. They are ordinarily operated at about 50 kilovolts and from 1-7 milliamperes with an average exposure time of from 10-30 seconds. Because of such factors as poor shielding of the x-ray tube, the large opening for the feet, and the excessive amount of current being used, considerable amounts of stray radiation are usually found around the machines. High concentrations of radiation are similarly found in the foot chamber, particularly when no filtration by aluminum has been provided. Experiments were conducted which demonstrated that with proper filtration and operating conditions, a maximum of 12 roentgens per minute in the foot chamber was sufficient to provide a clear image of the feet in most shoes. Following several confer-

ences with groups interested in x-ray shoe fitting, regulations were drawn up which limit the primary beam intensity in the foot chamber to 12 r/minute, and which caution customers using the machine to limit themselves to five fittings per day and 20 fittings per year. Stray radiation intensities are limited to 12.5 mr/hr at several locations, and safe operating conditions are described. In addition, the regulations require a five-second timing device, one mm. of aluminum filtration on the primary beam, and two beam intensities less than 12 r/min. for use on women and children. Since the regulations were issued, about 70 of the estimated 200 x-ray shoe machines in the city have been examined. Measurements of direct beam intensities in the foot chambers have shown an average value of 50 r/min., while several machines have been found which were well over 100 r/min. Stray radiation intensities in the vicinity of these machines are often several hundred milliroentgens per hour, and two old machines ran as high as 21,600 mr/hr. For making these measurements, a Victoreen Condenser r-Meter and a Beckman MX-2 Survey Meter were found to be most satisfactory. In general, the program has met with excellent cooperation to date; and a number of merchants have already obtained machines which meet the regulations, or are in the process of making such changes as are necessary.

MR. H. G. DYKTOR completed this session by presenting "The Role of Industrial Hygiene Agencies in Air Pollution Control." The official industrial hygienists are presented with an opportunity to take charge of local air pollution problems. It is the opinion of the writer that they should accept this opportunity, as, otherwise, there will be much more of the sensational publicity that has recently invaded magazines and newspapers. This type of approach will not solve any problem. Municipal administrations are aware of the demands of their communities for a decent living environment and are trying very hard to meet them. These municipalities have also found that the old-fashioned methods of enforcement and the emphasis on abatement of smoke only are inadequate. They have been made aware of this condition by a few cities, among them Cleveland, which have taken the lead in expanding this limited program into the wider one of air pollution, which includes the discharges from industrial operations. It is unfortunate that little fundamental research work has been done on the effect of air pollution on human beings, animals, and property. However, progress is to be expected if there will be a concerted movement among the municipalities to seek a solution of the problem by a scientific approach. To effectuate this approach, the writer is convinced that the industrial hygienist is, at present, the only individual who understands and has had experience in problems connected with air contamination. He has had experience with emissions from industrial operations; and he is skilled in the matter of sampling, analyzing, and evaluating a wide range of air-borne contaminants. He has also developed a philosophy of education, cooperation, and persuasion which makes him outstanding among official agencies in getting achievements without evoking his police powers. This endorsement of industrial hygienists as the most competent to engage in the control of air pollution is supported by the Donora investigation in which the Division of Industrial Hygiene of the U. S. Public Health Service was called, rather than any other division. This does not imply that in an air pollution control program there is no need for other types of technical assistance, but it does mean that the industrial hygienist is generally regarded as the one who has the fundamental "know-how" to tackle this problem. An example of the industrial hygienists being called to take over the administration of an air pollution control program can be found in Cleveland. While this Division of Air Pollution control cannot be cited as a typical example, yet it constitutes an organization which may be copied with profit. However, if the various activities related to air pollution such as industrial hygiene, industrial nuisances, and smoke abatement, cannot be combined into one division, there is need to establish close cooperation with any existing organized unit, and the industrial hygienist should pre-empt the field of industrial air pollution. Where there are too few or no local bureaus of industrial hygiene, the state bureaus will have to assume the responsibility and will have to be expanded in order to meet that responsibility. In brief, the demand of a community for a decent living environment must be met in a realistic manner, and yet industry must be granted the right of reasonable operation. The balance must be struck on an equitable basis, founded on a scientific approach, and both the economic and social aspects will not be neglected. Present experience proves that the official industrial hygienist has the greatest potential for success, and he must, therefore, assume a leading role in the control of air pollution.

American Association of Industrial Physicians and Surgeons

TUESDAY Morning, April 5: The first of the section meetings occurred on this date and was that of the Section on General Manufacturing. Presiding was DR. MARION W. JOCZ.

DRS. O. J. PRESTON, KENNETH SMITH, G. E. KOHLER, and FRANK BARKMAN, of General Motors, gave demonstrations of "Ingenious and Unusual Devices for use in Industrial Medical Departments." Their presentations appear on pages 263-267 of this issue.

DR. J. R. ROGIN spoke on "The Relative Infrequency of Occupational Dermatoses in Automobile Workers," stating that a considerable number of persons, including himself, had previously had certain notions relative to the occurrence of dermatitis in the automobile industry. Varying figures were given to show the percentages in different plants ranging from 2 to 20%, namely 2, 4, 6, 9, and 20% respectively. In a large series of cases among 340,290 persons, some 0.66% were industrial, 2.53% were non-industrial, with a total of 1.43% of cases of dermatoses occurring in the group. In 2400 private cases, 6.8% were contact dermatitis and 93.2% were of other kinds. In another experience, the plant physician took care of 93% of the cases of dermatoses which occurred and referred 274 cases, or 7%. The relationship of industrial to non-industrial cases, therefore, appears to be equal to the fraction ½. The distribution of lesions showed, in the automobile cases, 90% of the hand and 10% other; in the private cases, 10% were found in the hand and 90% in other portions of the body. As to compensation cases, there were

nine of these which showed an average of 18 days' disability. The percentage of compensation cases represented by dermatoses was 1.2. The relationship in man-hours was rated as follows: an exposure of 80,000 man-hours produces one case, and an exposure of 12,000,000 man-hours produces one compensation case. In the etiology of the dermatoses of the hand, the following agents are important to consider: (1) physical agents; (2) contact irritants; (3) contact irritant plus secondary infection; (4) contact irritant plus focal infection; (5) infectious agents; (6) focal infection; (7) miscellaneous and rare causes. Of cases, 97% appear on the dorsum of the hand. In summary, dermatoses have been a minor problem among auto workers. Such cases rate low in prevalence, severity and costs.

DR. CHARLES F. KUTSCHER presented the subject "The Ocular Effects of Ultra-Violet Radiation." DR. KUTSCHER reviewed the concept of the atom with respect to modern terms and with reference to light, and discussed the photochemical effects common in exposure to ultra-violet rays. Description was also given of the serious effects in some instances involving the behavior of electrons. A tabulation of the energy spectrum was demonstrated with reference to electro-magnetic rays, infra-red, the visible rays, ultra-violet rays, x-rays gamma and cosmic rays. Electric welding was discussed, and it was noted that the temperatures may vary from 3000° to 6000° F. Differences in the point and external sources of light were illustrated and discussed, and the effect of angulation was also included. Colored slides of burns were shown to demonstrate the various types of effects.

DR. W. B. KOUWENHOVEN presented "The Effects of Electricity on the Human Body." This paper appears on page 269 herein.

In the discussion it was brought out that there is no effect of radar on the eye—these are long wave lengths. Along with this was mentioned the mechanism of cataract in infra-red rays.

DR. VOSBURGH reviewed fibrillation experiments and showed electrocardiograms of fibrillation after shock. Kodachrome photographs of burns were displayed, and there was a statistical table given of deaths from electric shock. Further discussion of cases of fibrillation, noted one which recovered after an operation of opening the chest. There was also description of Ivory's case. It was especially emphasized that the pole-top method of resuscitation saves more shocked linemen than the prone pressure method, because it can be done right on the pole. More research is needed on this subject.

Wednesday, April 6, Morning Session

THIS session, opened by DR. HAROLD A. VONACHEN, President of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, was a panel on "Cardiovascular Disease in Business and Employment," with DR. RAYMOND HUSSEY, Dean, School of Occupational Health, Wayne University School of Medicine, presiding. The members of the panel were as follows: EDWARD D. SPALDING, M.D., Moderator, Professor of Clinical Medicine, Wayne University; RUFUS B. CRAIN, M.D., Director, Kodak Office and Camera Works Department, Eastman Kodak Company; WARREN B. COOKSEY, M.D., Attending Physician, Division of Cardiology, Harper Hospital, Detroit; DOUGLAS DONALD, M.D., Chief Cardiologist, Jennings Hospital, Detroit; LEONARD J. GOLDWATER, M.D., Columbia University, New York, Chief, Work Classification Unit, Cardiac Clinic, Bellevue Hospital, New York; E. A. IRVIN, M.D., Medical Director, Cadillac Motor Division, General Motors Corporation; GORDON MYERS, M.D., Professor of Medicine, Wayne University; ROBERT L. NOVY, M.D., Senior Physician, Division of Cardiology, Harper Hospital, Detroit; F. JANNEY SMITH, M.D., Physician in Charge, Division of Cardio-Respiratory Diseases, Henry Ford Hospital.

Although this will not include the remarks of the panel members, which it is expected will be published later, the outline is here reproduced, this being a very thoughtful piece of work:

I. What Are the Essential Features of Employment Problems in Connection with Heart Disease—DR. E. A. IRVIN.

II. Pre-employment Examination (Pre-employment evaluation of the heart):

A. Pulse Rate:
1. What is normal pulse rate?
2. Tachycardia—how fast a pulse within safe limits?
3. Bradycardia—how slow a pulse within safe limits?
4. Premature contractions ("Extra-systoles")—What is the significance of these?

B. Blood Pressure:
1. What are the safe limits of blood pressure, upper and lower for both systolic and diastolic?
2. Significance of pulse pressure.
3. Significance of a blood pressure of 90/60?
4. Should an asymptomatic blood pressure 180/110 be given special work? 210/120? 240/140? Is age a factor?
5. Does an unstable blood pressure have any prognostic significance in relation to future hypertension?
6. What standards should be set for particular occupations such as railroad engineers, truck drivers, crane operators, and others?

C. The Significance of Murmurs:
1. What is the significance of systolic murmur at the apex?
2. What are the factors influencing life expectancy and work capacity of:
(a) Mitral insufficiency? } or both?
(b) Mitral stenosis? }
(c) Aortic insufficiency? } or both?
(d) Aortic stenosis? }

D. Heart Size:
1. When is the heart significantly enlarged?
2. The value of studies of the heart size from routine and serial chest x-rays?
3. The evaluation of work capacity of slightly enlarged heart and moderately enlarged heart?

E. Obesity in Relation to Heart Disease:
1. The significance of obesity in evaluating work capacity of the cardiac patient?
2. Does obesity alter the life expectancy of the patient with heart disease?

F. Electrocardiography:
1. Should it be performed on all employees?
2. Selected groups?
3. Frequency?
4. What is the value of the EKG in evaluating the work capacity of an individual?

III. What are the essential problems the medical practitioner faces regarding the employment of individuals with heart disease? Appraisal of physical capacities and demand.—DR. LEONARD J. GOLDWATER.

IV. Periodic Health Examinations:
1. From the standpoint of heart disease, are such examinations of value to the employee? to the employer?
2. How often should periodic examinations be made?
3. At what age should annual examinations be considered compulsory?
4. Should the older age groups be examined more frequently than the younger age groups?
5. Should all individuals over 40 have an electrocardiogram? Why?
6. The value of periodic examinations in job placement in the older age group, especially those with heart disease.
7. Should an erythrocyte sedimentation rate be a routine test on periodic examinations?

V. Results of Experience in the Periodic Examination of Individuals—DR. RUFUS B. CRAIN.

VI. Re-examination of Employees Absent Because of Illness Due to Heart Disease or Other Illnesses (Sick Leaves):
- A. Rheumatic Fever—Rheumatic Heart Disease:
  1. How soon after an attack of rheumatic fever may a person be safely re-employed?
  2. What job limitation should be imposed by rheumatic heart disease in its various degrees?
  3. What value is an erythrocyte sedimentation test in determining the status of rheumatic fever?
  4. What job restrictions should be placed on an individual with a history of rheumatic fever during childhood with a resulting mitral murmur with history of decompensation?
- B. Precordial Pain (Coronary Insufficiency without Infarction ("Angina Pectoris")):
  1. What is the significance of this symptom in evaluating the patient's cardiac condition?
  2. Differential diagnosis.
  3. Should precordial pain with ordinary effort preclude the patient from returning to limited work?
  4. Is precordial pain a better index to the condition of a coronary patient than the EKG?
  5. When is a patient disabled due to coronary artery disease?
- C. Myocardial Infarction (With Coronary Artery Disease) ("Coronary Disease"):
  1. How can one determine what is *adequate convalescense* for a patient who has experienced a myocardial infarction?
  2. How long a sick leave should be granted to an individual experiencing his first myocardial infarction?
  3. What are the criteria for approving an individual for work following an attack of coronary thrombosis with myocardial infarction?
  4. What job restrictions or limitations should be placed on an individual having experienced an attack of coronary thrombosis with myocardial infarction?
  5. What factors may aid in determining these restrictions?
  6. Will employment, with selective placement, tend to hasten the recurrence of myocardial infarction?
  7. Why is it important to follow up on the job placement of such patients?
- D. Effort Syndrome ("Neurocirculatory Asthenia"):
  1. What is it?
  2. How important?
  3. Is it a forerunner of organic heart disease?
  4. The importance of the psychosomatic point of view in diagnosis, therapy, and prognosis in dealing with cardiac patients.

VII. Socio-Economic Considerations Related to Heart Disease:
1. What are the criteria for total and permanent disability in an individual with heart disease?
2. Are home conditions and transportation methods important in the total picture of the patient with heart disease?
3. Is part-time employment for patients with heart disease practical in industry?
4. What is the effect of an aging population on:
   (a) Criteria for employment of the cardiac patient?
   (b) Retirement age?
5. Second injury clause and fund—re heart disease.
6. The importance of effective relationship between industrial physicians and the family physician.

VIII. Heart Disease in Relation to Insurance and Compensation:
1. Can work cause heart disease?
2. Can work involving lifting affect the normal heart?
3. Can contusion, crushing injury or blow of chest injure the heart? How?
4. Can trauma, directly or indirectly, produce disturbance of cardiac function (a) arrhythmias, (b) myocardial failure, (c) coronary insufficiency, in the normal heart? diseased heart?
5. Can pain from trauma aggravate heart disease?
6. Can heart disease cause accidents?
7. Is angina pectoris disabling?
8. Can emotional upsets or disturbances related to episodes at work, such as argument, aggravate heart disease?

1. With respect to this panel outline, please let us have your suggestions as to omissions or additions, or other comments.

2. Will you state the problems of heart disease which, from your experience, appear to be the most important to the industrial physician?

3. How can this panel be improved as an instrument of education for physicians in the field of medical service to industry? (Particularly with reference to developing effective communication between general practitioners, cardiologists, and industrial physician.)

4. What would you suggest as a program for a community project to facilitate the proper placement, heart maintenance, and safety of individuals with heart disease with reference to employment?

Wednesday, April 6, Afternoon Session

THIS was a joint meeting of all five groups, with DR. HAROLD A. VONACHEN presiding. Among the papers presented, COMMISSIONER DONALD LEONARD, of the Michigan State Police, discussed "Catastrophe Control." The war of tomorrow envisions terrifying prospects. In the new concept of warfare it has come to be recognized that civil defense is the bulwark of all defenses, for if populations are prostrated and industrial production destroyed, there will be no weapons for the fighting forces—and that means defeat. Realizing the importance of civil defense and the fact that the times are filled with dark portents, we should be energetic in setting up our safeguards. The preliminary steps are already under way, but there is still much to do before we can feel that we have taken all reasonable precautions for an emergency. Last November the civil defense planning division of the Office of the Secretary of Defense submitted a report embracing a civil defense program. The Secretary of Defense will in turn report to the President, who, it is expected, will then ask Congress for suitable legislation. Fundamentally, the proposed protection pattern follows that of the last war. It would comprise such services as medical and health, air raid wardens, fire, police, evacuation, housing, food and clothing, emergency transportation, communications, radiological defense, chemical defense, engineering, etc. Because certain governmental agencies, including the military, have a primary interest in the production of war material, they would also have the primary responsibility for the protection of plants and facilities having to do with such production. Each of these plants and facilities would have a civil defense organization of its own—fire, rescue, medical and the other services—but it would also be concerned with the problem of sabotage. This would call for the careful screening of employees, the prevention of subversive acts, and measures to keep secret information secret. New to us in the next war—if there is one—will be radiological defense. In planning for that we are under a handicap, for we know only in general terms what we may be up against. There have been many horrifying descriptions of what occurred in Hiroshima and Nagasaki, and a certain amount of information has been revealed regarding the Bikini tests. But the scientists do not concur in their conclusions, and to add to the perplexity there is the conjecture as to just what progress there has been in making the atomic bomb even more devastating. In any defense program we must also assume that an enemy daring to attack us would have the bomb. We must likewise be prepared for germ warfare and other methods of destruction. The new civil defense plan takes these new forms of warfare into account, and, while losses would be heavy, we need not be as fearful as many of us are at the moment. The medical, health and nursing services will comprise one of our most important civil defense problems in any future conflict. If we are under attack, these services will be in great demand, but the same skills are in similar demand in the armed forces. The shortage of such professional personnel on the home front during the last war was of serious concern. The problem of providing adequate medical services should receive immediate attention.

ASSOCIATION NEWS

The Medical Director and X-Ray Surveys

THE matter of supplying the plant Medical Director with the information obtained about plant employees through chest x-ray surveys has been presented to this Association by its committee on tuberculosis, and within the past few years has been the subject of discussion by the Board of Directors at considerable length. A resolution concerning it was adopted and copies, with an explanatory letter, were sent to DR. KENDALL EMERSON, Managing Director, National Tuberculosis Association, and to DR. FRANCIS J. WEBER, Medical Director, Chief, Tuberculosis Control Division, U.S. Public Health Service. The present Chairman of our Committee on Tuberculosis is DR. LEO PRICE, Director of the Union Health Center of the International Ladies Garment Workers' Union, New York City. The discussion brought out the fact that there is a marked difference of procedure in various localities throughout the country. In some large cities it is the established policy to inform the Medical Director of the findings disclosed by chest x-ray surveys and to solicit his cooperation in following up the cases through the employee's family physician and the local health department's follow-up service. Other localities furnish this information on request and review the questionable or problem films so that the plant Medical Director can have additional films made as necessary. In some localities, however, the Medical Directors are having difficulty in obtaining these findings.

As to the reasons that have led up to this situation, it is well known that when chest x-ray surveys were begun the policy of not informing the plant Medical Director of the findings was started in some places specifically to quiet the objections of unions or union representatives. This condition no longer exists, and employees, labor unions and labor representatives are now staunch advocates and supporters of the plant chest x-ray survey. They realize it is for the benefit of the workers, and they are interested in proper guidance, evaluation, consultation, job placement control and later rehabilitation of the employee with chest pathology.

Further concerning the reasons why the Medical Director is entitled to full information about plant chest x-ray surveys, the Medical Director as part of his responsibility assumes certain duties in control of contagious and infectious diseases among the workers. He is responsible if a contagious-diseased person is permitted in the plant and allowed exposure to the other workers there. He knows how to advise, assist and place the worker with a suspicious chest x-ray lesion. He also is in the best possible situation to aid in the proper referral of that individual to his family physician, or to a clinic, and is in the ideal position to assist in the proper tactful follow-up. He has to give consideration to the employment and proper job placement of applicants with arrested pulmonary tuberculosis or suspicious chest lesions. He must know these things so that he does not improperly permit a suspect or recently arrested case to do heavy work in dusty, damp, wet or other hazardous places. He controls the amount of overtime, the rest periods and the question as to whether it is proper and safe for a particular employee to do night work. He recommends and approves leaves of absence for illness, and approves benefit payments for time lost on account of illness. He recommends and follows up chest x-ray studies at stated intervals or properly indicated periods. Later when the employee returns from a period of illness or after a pulmonary tuberculosis case has been arrested he places him in proper employment. He recommends daily rest periods and, by his counseling supervision and assistance, he follows through on the rehabilitation of the chest lesion case to full employment. He is in a position to allay the anxieties and fears of fellow workers who may object to working next to an employee who has been a patient in a tuberculosis sanitarium. And he can obtain the sympathetic and financial support of management for the employee with an active or arrested chest lesion. He explains and approves proper periods of absenteeism so that supervision will not become critical.

It is of course recognized that chest x-ray surveys are only methods of preliminary screening to find chest pathology or to observe some slight change in the film suggesting chest pathology. All of the cases, therefore, must be studied further to determine the actual, or to clarify the diagnosis of a suspected, chest lesion. Sometimes the chest survey findings are classified as follows: (1) Arrested or inactive pulmonary tuberculosis. (2) Active pulmonary tuberculosis from the early minimal through all stages to the advanced pulmonary tuberculosis cases. (3) Non-tuberculous chest pathology.

In order to obtain and effect the proper additional 14 x 17 films and further laboratory and clinical examinations and studies, these findings should be reported to some physician who will carefully and conscientiously do all of the procedure necessary to arrive at an accurate diagnosis. Frequently this is the family physician, and rightly so if he is competent and honest enough to follow up the case properly But all too often we see the family physician minimizing or trying to "laugh off" these suspected chest x-ray findings. There are many plants, especially small ones, that do not have plant physicians or an adequate or comprehensive plant medical service. Many have only "on call" physicians and surgeons who do not render a complete medical service and are interested primarily in the accident cases and not in the non-compensation plant patient. It is unwise to release chest x-ray survey findings to such a physician and expect him to carry out the proper additional study and follow-up. And lay members of management, personnel directors, employment managers, claim managers, plant superintendents or general managers, frequently lack a proper understanding of this problem. These persons should not receive information about chest x-ray surveys.

It is a serious error of judgment on the part of management in any way to jeopardize the employee's position if his condition is such that it is safe and proper for him to work. A still greater error is committed if management discharges any employee because of a chest x-ray finding. This should never occur. If the employee has only a suspect chest lesion he may get an entire clean bill of health and be fit and proper to do any kind of work. If his chest condition proves to be a minimal lesion or of such degree that he should not work, he should be

given a sick leave of absence with all the benefits, rights and privileges that are offered employees for other illnesses. Frequently management will help finance his medical expense and treatment in addition to these benefits. The responsible plant physician or medical director should be given the findings of the chest x-ray surveys and charged with the responsibility of adequately and properly following these cases. The waiver method has often been used in this connection.

A very complete and worthwhile publication covering many of these points was recently issued by the Industrial Hygiene Foundation, 4400 Fifth Avenue, Pittsburgh 13, Pennsylvania, entitled "Tuberculosis in Industry," Medical Series Bulletin No. IX. It should be studied by every plant medical director and plant physician, and be available for reference in every medical department.

NEW BOOKS

Odors—Physiology and Control

ODORS—PHYSIOLOGY AND CONTROL, by CAREY P. MCCORD, M.D., The Industrial Health Conservancy Laboratories, Detroit, and WILLIAM N. WITHERIDGE, Ventilation Consultant, General Motors Corporation, Detroit. First Edition, 6 x 9, Cloth, 405 pages, including Bibliography and Index. McGraw-Hill Book Company, Inc., New York, London, Toronto, 1949. Price $6.50.

IF A TIME-CAPSULE containing a cross-section of today's national advertising could be opened a thousand years hence, a reasonable commentary following its examination might well be that we were a smelly people, living in a smelly world. For, to most of us who haven't the blessing of some degree of hyposmia, we are, and it is. But that isn't a modern condition; history and literature alike are persuasive that man could smell about as soon as he could see and hear; and the many references to perfumes in his long annals are redolent, as it were, of the facts not only that he could, and did, but also that he has been doing both for a very long time. Modern, however, is the study of *how* he does it. More modern is the investigation of *why*. Modern to the minute is this new, right-off-the-press, first and only book on the science of "how" and "why," *and* the techniques of what can be done about it, especially in industry.

"Smell" is an interesting word. As a unit of language it is a transitive verb, an intransitive verb, and a noun. Expressing its mode of action, man smells both objectively and subjectively. In its nominal capacity, a smell is an odor; an odor is a sensation; a sensation is a sense response. On the harp of the senses the strings are variously moved: touch and taste by the plectrum of substance; hearing by the waft of waves; sight by the absence of darkness. But the subjective "smell"-tune is played on a lone string, for an odor has no visibility, no vibration, no palpable patency. It is, and it isn't. It is here, but try to comprehend it and it's gone. It has no form, no weight, no tenure; defies the spectroscope; leaves no mark on the film. One might easily conclude " 'tis something, nothing," and dismiss it as an abstract idea, and its effect as a mere excitement of function. One might—unless he were blessed with the indefatigable interrogatory that distinguishes the true scientist. So gifted, he would go after the "something." For, at the end of all the interesting speculations aroused by the fact that "Odors" now, for the first time, have a book of their own, is the inescapable conclusion that an odor *is* something. It *must* be something; the olfactory organs just don't respond to "nothing"; a degree of tangibility *must* exist for them to be stimulated to conscious awareness. But what is it that stirs them? What really is an odor?

This is a good question. And the pursuit of the answer, evidenced in this book, strongly reminds of the experience of Sir James George Frazer, who undertook to explain "the remarkable rule which regulated the succession to the priesthood of Diana at Aricia." In his words, "When I first set myself to this problem, I thought the solution could be propounded briefly, but I soon found that to render it probable, or even intelligible, it was necessary to discuss more general questions, some of which had hardly been broached before." Sir James' years of work finally produced the gorgeous fascination of his classic study in magic and religion, "The Golden Bough." The similar expansion of this "Odor" subject as these authors followed it, and the constant growth of its treatment under their hand are indicated by the truly stupendous bibliography which fills 124 pages. The assembly and compilation of these titles alone must have taken many days and involved great expense—to say nothing of the labor of reading and evaluating the material. It should not, however, be inferred that this new volume is merely an ordering of the literature. It is, of course, but it is likewise so vastly much more that the rather infrequent documentations throughout the text are almost incidental. It is a thorough-going scientific treatise, original in concept, complete in scope, painstaking in detail, authoritative in execution, with an enrichment from thought and experience and a charm of style that make it interesting to read just as a book, entirely aside from its value as a source of information on odor problems. Like the quest of Sir James, it ended far from where it began, and with a comparable addition to the literature of science.

But what of the odor, *per se?* Is it a gas, an essence, a vapor, a vibration, a radiation, a molecule, a form of energy, an electric potential, a chemical structure? Sir James found his answer; did these authors find theirs? There have been 23 theories. "A few are nearly fantastic; a few are impressive; none is adequate to real understanding of the complex ramifications of olfaction." The manner in which the authors dispose of the various hypotheses is not only interesting, it is also stimulating in its simplicity. Thus, as one example, "Atomic oxygen (O_1) is not available for odor perception. Molecular oxygen (O_2) is odorless. Ozone (O_3) possesses a definite odor. . . .It might be inferred that increasing atomicity is the key to odor stimulation. At once this breaks down from the knowledge that phosphorus in its yellow form (P_4) is odorous, while in the red form with increased atomicity ($P_4 + n$) it is odorless." The authors then submit a theory of their own, based on molecular configuration. "Odors are derivable only from gases and vapors because of the functional necessity of a high degree of molecular dispersion. . . .For all molecules with three or more atoms, the electron arrangement is conceived to exist as angles—bonding angles between the atoms. . . .Modification of the bonding angles at the moment of solution is believed to be

associated with the rearrangement of the electrons with adjustments or alterations in potential or vibrational energy. . . .On the solution of an odorous substance on the olfactory mucosa, it is believed that the electrostatic fields are so altered or unbalanced as to provide a potential difference affecting the olfactory receptors there present for that very purpose. . . .chemical structure as it influences bonding angle energy readjustment within the molecule at the solution moment may be the determinant of odor."

Intriguing, however, as the identity of the odor "something" may be, the authors, having given it due place in the organization of their subject, go on to the comprehensive analysis of odor perception, measurement, classification, regulation and control. The emphasis is on the control of odors in industry, but there is also a thorough discussion of practical methods for eliminating odors from public buildings, homes, and the person. This reviewer has felt that the listing of chapter headings in a book notice is often a lazy way of filling the space. But the chapter headings of this book are so well chosen, and so descriptive in themselves, that they give a better picture of the scope and treatment than would many paragraphs of comment. Thus:

I. The Anatomy of the Olfactory System.
II. The Physiology of the Olfactory Sense.
III. Chemical Constitution and Odors.
IV. Odor Classification.
V. Odor Detection and Measurement.
VI. The Pathology and Perversions of the Olfactory System.
VII. The Influence of Odors on Health and Comfort.
VIII. Human Body Odors in Health.
IX. Human Body Odors in Disease.
X. Odors in the Diagnosis of Disease.
XI. Household Odors.
XII. Odors of Waters and Foods.
XIII. Industrial Odors.
XIV. The Offensive Trades.
XV. Air Conditioning and Odors.
XVI. Chemical and Physical Destruction of Odors.
XVII. Odor Masking.
XVIII. Odor Cancellation and Counteraction.
XIX. The Sorption of Odors.
XX. Odors as Warning Agents.
XXI. Odor Repellants and Odor Attractors.
XXII. The Making of an Odor Survey.
XXIII. The Legal Aspects of Odor Nuisances.

The text of this book conforms to the best standards of scientific exposition; the style is firm, clear, flowing, never heavy. The reader, however, may easily become conscious of a peculiar facility of expression which gives him the extra dividend of seeming to be able, at the instant of reading, to view the subject matter of the sentence from all possible angles and then to pass on with the feeling that both he and the author have selected the best angle and described it in the best possible way. This is an elusive quality, rarely encountered, and defying analysis because it exists only when it is effortless, and disappears when it is striven for. It adds immeasureably to the value of any book, and particularly to the value of this one, which, by virtue of its subject, its scope, and its timeliness, has many values to many people. Odors are well-nigh ubiquitous, and, as to most individuals, are a part of personal life. Protean in manifestations, they attract, repel, rouse, lull, startle, warn, please, disgust, excite, nauseate, according as they are of one kind or another. Many, therefore, in all walks of endeavor are interested in odors, and for a wide range of reasons. They will find this book useful whatever the direction of their interest. Among them are physicians, research workers, chemists, perfumery and cosmetic technicians, air conditioning specialists, public health officials, sewerage disposal and sanitation engineers, industrial hygienists, druggists, *and* lawyers. Each may derive from it a practical working knowledge of olfactory physiology and anatomy, the hedonics of odors, the relationship of odors to health, and certain of their legal aspects.

"Odors—Physiology and Control" is excellently put up; well printed, adequately illustrated, strongly bound. The bibliography contains citations to 159 leading cases on matters involving odors. There is a satisfactory subject index. This book is certain of its function and direction; reflects its time; has vitality and an honest character; and is so studiously and expertly done that it should remain the *first* of its kind long after it may have ceased to be, as it is now, the only one as well. We predict that it will never become "anonymous among its fellows."

LETTERS

The Scope of Medical Services

TO THE EDITOR: In view of some of the articles you have published which are favorable to a comprehensive medical care program, you might like to use the following adverse opinion:

It appears that not all socialization of medicine is occurring through legislation by government. Some industries have adopted comprehensive programs of medical care which, by providing complete medical care for employees, have in effect socialized medicine for their industry and, to an extent, for their community. This is as true as if it had been accomplished by government decree.

Industry has, of course, moral and legal responsibility to provide care for occupational disease and industrial accidents. However, when industry adopts extensive programs which provide for the complete care of non-occupational conditions it invades the responsibility of the individual and takes on the character of socialization. Such service must of course be paid for, and, since industry cannot tax, as does the government, the cost must be recovered in the price of the product. Either way the public must pay.

Industry should not socialize its medical activity even to gain financial ends. It has been argued that only healthy employees work at maximum efficiency; that complete medical care results in a lower absenteeism rate and in higher employee morale. It has also been stated that companies that provide complete medical care for their workers are thoroughly convinced of its financial worth. These are the familiar contentions advanced in favor of government socialized medicine. It is not consistent to install socialization in industry while resisting the same philosophy at the national level.

Socialized medicine in industry will lead inevitably to socialized medicine in government. It is not in accord with the pattern of American life.

—A. F. LECKLIDER, M.D.,
848 Berkshire Road,
Grosse Pointe Park 30,
Michigan.

"No Such Thing as Bed Rest"

THE FOLLOWING *is from an address entitled "America's Number One Medical Problem," by* HOWARD A. RUSK, M.D., *at the Forty-Second Annual Meeting of the Life Insurance Association of America, December 9, 1948, as published in the Proceedings:*

WE LEARNED very early from clinical observation that there was no such thing as bed rest. There is no state of suspended animation in which you can put an individual as you can a steak in a deep-freezer, and expect to take him out one, two, or 10 weeks later and find him to be in the same physical condition as when he was put there.

In our first experience in this field, we had to play by ear as it were. We took 650 patients all of whom had had virus pneumonia, and all of whom had been treated in the same acute wards. When it came to the convalescent period, we put them in alternate wards. Ward one waited for nature to take its course and went back to duty when they and the doctor felt they were able. They averaged 45 days in the hospital with a recurrence rate of 40%. In the case of group two, 48 hours after normal temperature, they started on a 12-day reconditioning program with half an hour on the first day and on the twelfth day five hours, including a 12-mile hike. They were 12 days in the hospital with a recurrence rate of 3%. That reduced our hospital time two weeks per patient and our recurrences by 900%.

Then in the Miami Hospital, where the weather was good, we took a group of men who had broken bones from the obstacle course or the rigors of training. They each had an arm or a leg fixed in a cast. We worked these men on a five-hour day, a strenuous five-hour day, and we found that, when the cast was cut away, there was no atrophy. I think now at last we know the reason for this and the discovery was made as a result of a piece of research at the Baruch Center for Physical Medicine at the University of Virginia. They did a very simple experiment down there two years ago and reported it. They took an individual and fastened one hand to the table, and in the other hand they put a dumb-bell. That individual lifted the dumb-bell until he became so fatigued he could not do it any more. Then he rested and started in over and over again, for a full hour. At the end of 30 days, they measured the arm that had done all the work. It had increased 30% in size, but the arm that had never moved increased 28% in size, showing that if you give the stimulus, nature does not differentiate the side to which the blood goes. . . .

Ancel Keyes and his associates at the University of Minnesota and Dr. David Barr and Dietrich and his group at Cornell took conscientious objectors and put them to bed for a period of from six to 16 weeks and they studied very carefully the effects of bed rest, and this is what happens: the average man's heart will decrease 11% in size, his blood volume will decrease from 5 to 15% under such conditions. Give him a piece of work to do that requires a pulse rate of 130 when he goes to bed, and at the end of six weeks it will require a pulse rate of 170 and it will take six weeks before that man can do the same piece of work with a pulse rate of 130. There is 35% diminution in reaction time, a marked loss of vitamin C and thiamin in the urine. There is a marked inability to do sustained work. It takes twice as much protein in the diet to keep an individual in normal nitrogen balance the first six weeks he is put to bed as it does if that individual is ambulatory, and it is a practical impossibility to keep him in normal calcium balance, regardless of how much calcium or vitamin D or anything else you give him.

There is enough meat in those summary findings that I have given to make us think about some of our present modes of the management of the convalescent patient. We keep a coronary in bed for six weeks, and rightfully so, and with such a regime, since it was started some 10 or 15 years ago, the mortality would go even lower if we knew the end point where we could exercise that man carefully in bed in order to prevent the deconditioning of his heart muscle from bed rest, to prevent him from losing the calcium and proteins needed in healing. And what do we do when that individual gets up? We say, "Let him dangle his feet the first day." Maybe he could sit up in a chair for 10 minutes. Maybe he should only dangle one foot. Then we say the second day, "He can walk around the bed." Maybe he shouldn't; maybe he should walk only two steps. On the other hand maybe he could sit up in a chair half an hour. We don't know. There is no measuring rod by which you can say to a coronary at the end of his six weeks of bed rest what job he can do, how many hours a day he should work. The only measuring rod you have is that of clinical judgment—not too accurate a measuring rod sometimes. That, I submit, is one of the most greatly needed pieces of research in this whole problem of convalescence and the care of the chronically ill.

Then we became interested in the surgical field, and you know what happened there. Fifty years ago, a gynecologist reported 2,000 cases of female operations in which he got the patient up on the first or second day with an unusually good mortality rate, better than anything reported in the literature, but all of his colleagues felt that he was radical and crazy and nobody did anything about it. Now we know from 1,000 cases reported by John Powers in Cooperstown, New York, and 3,000 from Leithauser in Detroit and 1,000 from Allen Whipple here at Presbyterian Columbia Medical Center what happens in the early ambulation of surgical patients. These observers got one group up on the first or second day and they kept the other in bed the conventional period of time. They were all types of surgical procedures, from simple appendectomies to complete removal of the stomach. They varied in age from 16 to 85. The ones who got up on the first or second day got out of the hospital an average of five days sooner. They got back to their usual work an average of five weeks sooner, showing that they too had to overcome the same deconditioning phenomena we saw in our conscientious objectors when we put them to bed. The same thing obtained in those individuals. Complications were reduced by 50%, morphine requirements by two-thirds. These patients went on regular diet on the second or third day. Gas pains were practically unheard of. Catheterization was almost universally unnecessary in the early ambulatory group.

All of the observers said that the most dramatic thing about this entire series was the fact that they had the great will to get out and get well more quickly, and, psychologically, they were different people.

INDUSTRIAL MEDICINE

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The Whole Man

IT IS eminently sound that so much emphasis, these days, is directed toward consideration of the "whole man." This broadened concept of the individual has developed gradually following the acceptance of the principle of selective placement of employees in industry and the realization that mental and emotional qualities are just as important as physical characteristics. Since man is more important than the machine, preservation and utilization of the potentials of man require maximum knowledge of the person as an integrated individual. And increased knowledge concerning the individual leads to a better understanding of the group.

Perfect health is a rare thing, indeed. Health has been defined as a state of "complete physical, mental, and social well-being." There is an inadequacy in this definition but, accepting it as stated for the moment, it is interesting to analyze the changing concept of health. Health has been difficult to define always. Perhaps that is because it is a "polar" word. Thurman W. Arnold[1] in his discussion of polar words stated that they are words or terms which have little or no meaning in themselves but depend on the existence of a word with an opposite meaning before they can be understood. Thus, formerly "health" depended on our understanding of its opposite term, "disease" and implied, in a negative way, that it was the absence of disease. This being unsatisfactory, the recent positive approach was developed in order to define health as a state of "well-being." But now we are confronted with the question as to what is meant by "well-being." It also seems to be a sort of polar term requiring an opposite to clarify its meaning. This is the usual dilemma which confronts us when we try to define something.

However, the new trend is reassuring in that it gives us a feeling of greater positiveness, at least on superficial analysis. But, accepting the new definition, it is obvious that not over 5% could qualify as being in perfect health. Membership in the exclusive "five-in-a-hundred club" might be so difficult of attainment that the majority might consider it hopeless and decide they would prefer to enjoy ill-health before they become too old. And yet the mere fact of the rarity of perfect health helps emphasize the importance of careful pre-placement and periodic examinations to appraise the individual so that he may be in tune with his job assignment. The principle applies to *all* individuals because of the multitudinous variations found. No longer does selective placement have its chief applicability to the obviously handicapped; it should be a universal practice applied to all, since the completely healthy man does not exist.

The criticism that this approach is impractical and visionary arises because the possibilities have been explored so insufficiently, because intangibles are so often difficult to grasp, and because it has been customary in many plants to consider that the rank and file of employees, especially those in unskilled labor, need no appreciable personal evaluation. The latter viewpoint is manifestly unsound; not only does each employee merit study in his own right but the rationale of any case-finding procedure depends on its non-selectivity. The advice of the ancient Greek philosophers was, "Know thyself"; perhaps one creed for the modern employer should be, "Know thy employee." Such a creed for the employer is quite consistent with the necessity for operating at a profit in the American tradition of free enterprise in a competitive economy. Granted, it is necessary for a business to be successful financially. But there is such a thing as pragmatic idealism which, too, pays dividends.

Reverting to the definition of positive health, it is surprising that it refers to physical, men-

1. THURMAN W. ARNOLD: The Folklore of Capitalism. Yale University Press.

tal, and social qualities only. This may be because of evolutionary sequence, the most recent, hence relatively undeveloped quality being omitted. Quite naturally, first emphasis was based on the physical for many years. Later, the war and its aftermath helped focus attention on the importance of emotional reactions. Psychosomatic medicine emerged after the realization that mind and body are inextricably intertwined; for example, an employee with an excellent physique might be severely handicapped if emotionally maladjusted. The next development, no doubt, will be increasing recognition of the importance of social well-being. Such understanding will have powerful implications not only for the employee, but also on the plant as a whole, the family, the community, the nation, and the world at large.

THE omission in and the inadequacy of the definition of positive health consist in the failure to include the spiritual component. Surely, it is erroneous to assume that it is submerged under the category of mental health. A strong intellect with relative emotional stability cannot pre-suppose the co-existence of a sound spiritual background. Perhaps it is because we shun to speak of it or don't know how to approach the subject. But if we agree as to the importance of the all-inclusive "whole man" how can spiritual values be omitted from consideration? If we analyze the physical, mental, and social man, we will find the spiritual flowing through the entire structure, leaving its imprint and affecting it even though often unrecognized and not understood. It is suggested, therefore, that positive health be redefined as a "state of complete physical, mental, social, and spiritual well-being."

The Chinese, according to Nora Waln,[2] believe that "people can be too concerned regarding physical health and neglect the health of the spirit." This ancient race has not been concerned with the competitive struggle for technological supremacy and seems to have had more time for contemplation.

All religions and most philosophies agree on the fundamental principles of the Golden Rule. There is a spiritual quality in all people which needs only to be tapped. When inculcated into management policy, labor procedures, industrial relations, employee interviews, and health education programs, it will have a cumulative effect. There are innumerable opportunities to implant germs of truth which, in a suitable environment, will grow and flourish. Such practice will be shown to be just as much "good business" as any other feature in an industrial health program.

Over 300 years ago, John Donne[3] said we "are involved in Mankinde." We are a part of everyone and everyone is a part of us. Unless we consider the spiritual part of the "whole man" and include it in our definition of positive health we are unmindful of our true relationship to Man.

—FREDERICK W. SLOBE, M.D.

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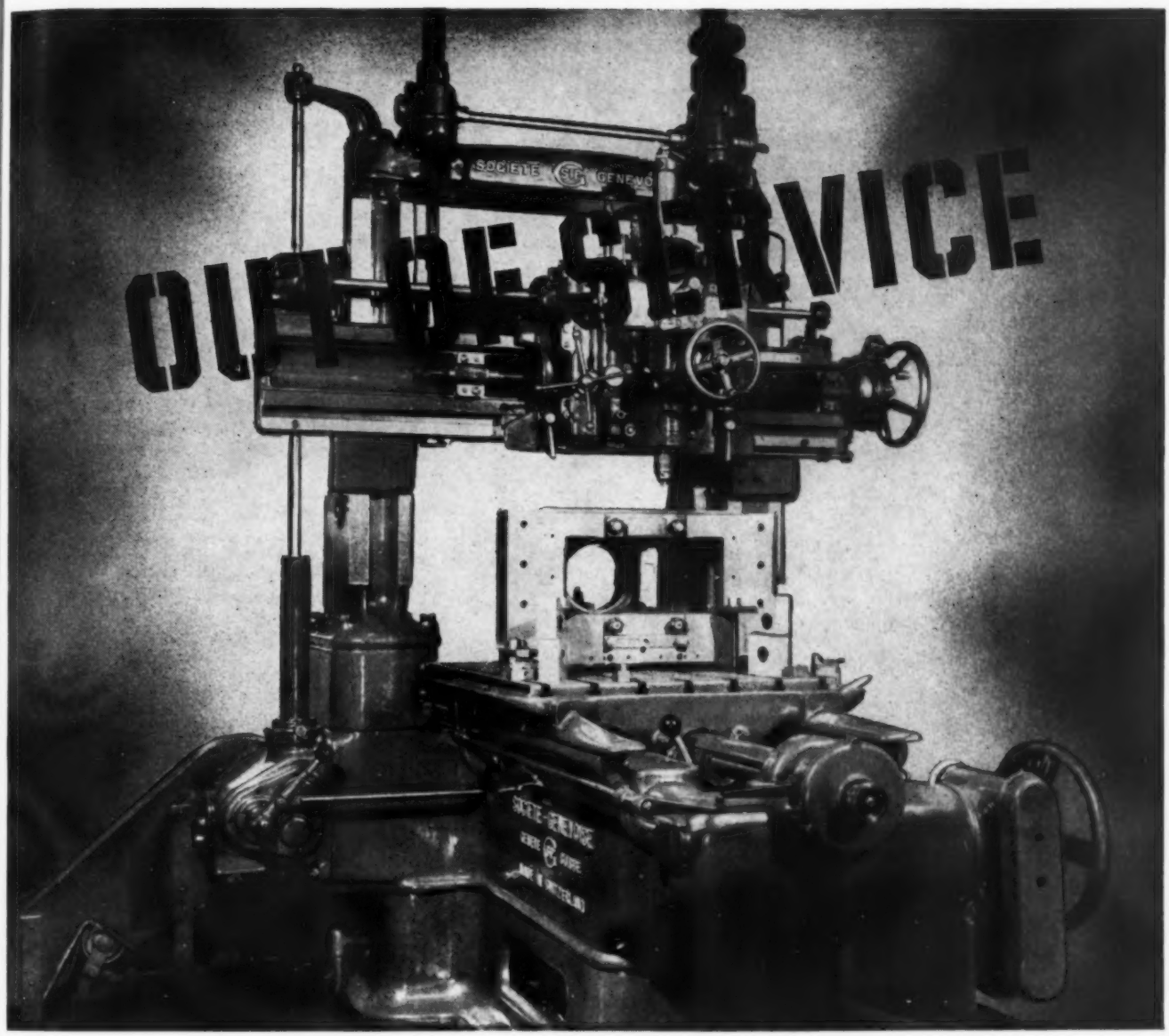
2. NORA WALN: "Atlantic Harvest." Little, Brown and Co.: Boston.

3. JOHN DONNE (1573-1631): "any man's death diminishes me, because I am involved in Mankinde: and therefore never send to know for whom the bell tolls; it tolls for thee."



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NEWS, COMMENT, OPINION

MAYBE what this country needs is less emphasis on the legislation of health and more on healthy legislation.

—*New York World-Telegram*, May 24, 1949.

Occupational Malady

A MAN with an old back injury for which he was drawing full workmen's compensation was referred to a well-known orthopedist. On his report the specialist wrote: "Patient is reasonably comfortable as long as he is not required to do any work of any kind." As an afterthought, he added: "Who wouldn't be?"

—IRVING MCNEIL, M.D., in *Medical Economics*, June, 1949.

Tension

OCCUPATIONAL disorders arising from overstrain, faulty working posture, work pressure, nervous tension, and wear and tear on the muscles of the skeletal system are often wrongly diagnosed as rheumatism and neurosis, two Norwegian physicians reported at the International Congress on Rheumatic Disease at a clinic session at the New York Hospital. The diagnosis of neurosis is sometimes made because the patient's pains vary with his state of mind, Dr. Henrik Seyffarth and Dr. Kirsten Moinichen, of Oslo, reported. Perfunctory examination, they said, may fail to disclose the organic cause of the muscle, tendon and joint pain. While neurosis may often be a causative factor, the "organic changes even then are due to overstrain and wear and tear of the skeletal muscles." Examination of 222 women clerks of an Oslo insurance company, they reported, revealed that 51.4% had fatigue pains during work. Dr. Seyffarth said that preventive steps should include inspection and correction of the employee's working site and manner of working, plus 10 minutes of daily light exercise in office hours, preferaby under the direction of a trained psysiotherapist.

—*New York Times*, May 31, 1949.

Something for Nothing!

ANNUAL contributions for social insurance in the United States recently amounted to four and one half billion dollars, according to "The Social Security Almanac" which has just been published by the National Industrial Conference Board. In 1929, less than one fifth of a billion ($169 million) dollars were paid in for this purpose, and in 1939, the amount was about "$2 billion." More or less comprehensive social security programs cost Belgium 23.5%, Czechoslovakia 22.8%, the Netherlands 20.3%, and Yugoslavia 28.0% of total remuneration. The Almanac points out that in all these countries except Czechoslovakia employers and employees share the tax, with the former carrying most of the burden. In Czechoslovakia, the entire tax (22.8%) is levied on employees.

Scabies, until recently regarded as a disease of poverty or uncleanliness, today is known to be found in all walks of life. This highly contagious parasitic infestation not infrequently escapes detection, hence the possibility of its presence must always be kept foremost in mind when a red, punctate, inflamed pruritic eruption presents itself.

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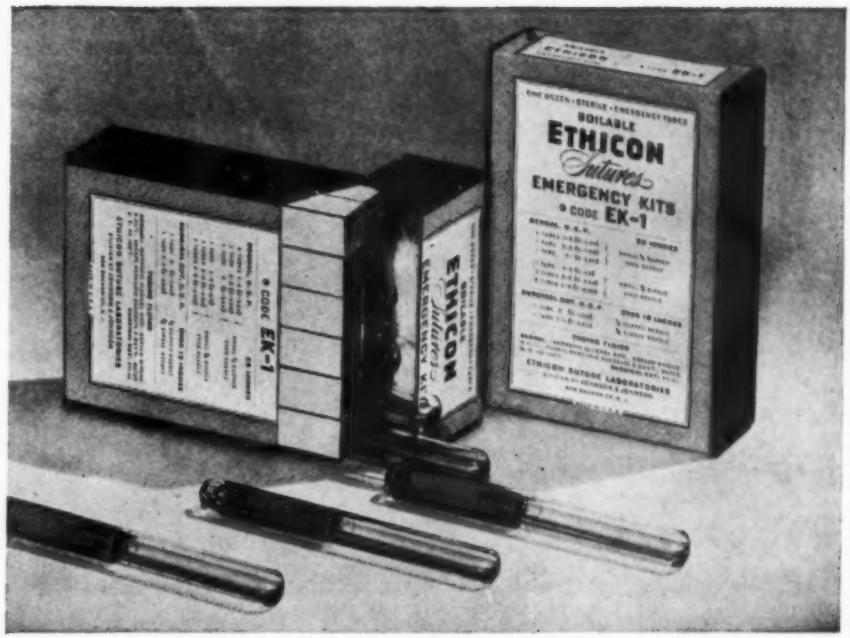
The Better Breakfast

IN A RESEARCH study conducted at a medical school it was shown that important and practical benefits result from the habit of eating a good breakfast. The demonstrable benefits included increased maximum work output, better maintained mental alertness, and lessened muscular fatigue, during the critical prenoon hour. Under controlled conditions a group of young women from 22 to 27 years of age were given an 800-calorie breakfast daily over a period of several weeks. When accustomed to this breakfast, they were checked for maximum work output; for mental alertness, as demonstrated by "reaction time," and finally for the magnitude of neuromuscular tremor. Then the subjects successively were checked for the same criteria after several weeks without any breakfast, after several weeks with only a cup of coffee with cream but no sugar, and finally after becoming accustomed to a 400-calorie breakfast every morning. This experiment is reported by W. W TUTTLE, MARJORIE WILSON and KATE DAUM, of the Departments of Physiology and Nutrition, State University of Iowa College of Medicine, in *J. Applied Physiology* (1:8, 545-559, February, 1949). They summarize the tests as follows: "Data collected twice each week, between 11:00 A.M. and 12:00 noon, relative to the effect of altered breakfast habits on physiologic response justify the following conclusions: (1) The omission of breakfast caused a decrease in maximum work output, an increase both in simple and choice reaction time, and in increase in tremor magnitude. (2) When coffee alone is substituted for a heavy breakfast there is a decrease in the level of performance in maximum work output, and choice reaction time; there is an increase in tremor magnitude. (3) When a light breakfast is substituted for coffee alone the level of performance of maximum work output and choice reaction time improves significantly; there is a decrease in tremor magnitude. (4) There are considerable individual differences in response to altered breakfast habits. (5) Because the breakfast period of coffee only occurred between heavy breakfast and the light breakfast periods a direct comparison of the physiologic responses during the light and heavy breakfast periods could not be made."



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Standing Orders

ALL employers are involved by the general principle of criminal law which states that any person who willfully and intentionally engages another to commit a criminal offense is as guilty as the person who commits the offense. It is apparent that the Medical Practice Act defines by law the hands in which have been placed the "public health and preservation of human life" —the hands of licensed physicians

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(1 Freed, J.A.M.A., Feb. 8, 1947)

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and surgeons. By the Nurses Act registered nurses and all others are explicitly defined as being excluded from the practice of medicine and surgery. Criminal law indicts the employer. Loss of registration, fine and imprisonment may follow conviction under these laws. These laws are the foundation of medical orders. Here they start that they may finish with the greatest possible benefit "to the public health and the preservation of life." In medical orders alone can the nurse in industry perform her invaluable service to medicine and the workers. Herein are designated her responsibilities and rights of action. Conforming to explicit medical orders she stands above criticism. She acts as the instructed agent of a licensed physician on whose shoulders lie justly the l e g a l responsibilities and penalties of the law. A grevious injustice is done to a nurse on whose shoulders are placed illegal functions by the dictates of a misinformed or law-evading employer. Stupid and deserving of reprehension woud be the nurse who willfully assumes such responsibilities and penalties. Whatever the circumstances, equally culpable of practicing medicine without a license are the nurse and the employer for whom the nurse is an agent. There is but one course within the law. It is this. No nurse can lawfully function under any circumstance without the explicit direction and supervision of one or more licensed physicians. In industry the physician must be associated with the management in such a way that he is free to exercise his responsibilities by personal supervision of all nursing functions. All employers should take heed. Legal consciousness of workers concerning welfare rights is a searching eye, growing in keenness. Time is running short when employer and nurse offenses against the Medical Practice Act, the Nurses Act, and Criminal Law will stand in the full glare of l e g a l judgment. These facts are urged on all employers who maintain a medical service without a specific physician responsible. All nurses involved in such illegal procedures should hasten the adjustment. May none have to bear the stigma and the shame of having besmirched their splendid profession.

—From "Standing Medical Orders for Industrial Nurses," by F. BENEDICT LANAHAN, M.D., in *Pennsylvania Med. J.*, May, 1949.

Industry Hospital

A MILLION dollar general hospital built by a nonprofit corporation founded by local industries was opened May 7 at Lufkin. More than $1,000,000 was contributed by 14 business firms and industries. The 102 bed hospital will serve 4,000 employees of the sponsoring companies for whom it is primarily intended, although it can accommodate the citizens of Angelina County during normal times. Only unusual circumstances will necessitate giving preference to employees of the companies. Governor Beauford Jester gave the dedicatory address. DR. U. GAIL MEDFORD, Lufkin, will be chief of staff. Lufkin is the county seat of Angelina County.

Beryllium Phospor

THE MAJOR manufacturers of fluorescent lights have stated that after June 30, 1949, they will no longer use beryllium phosphor in their manufacture. For several years the industry has been working with medical men towards eliminating the dangers of beryllium in these lights. DR. JAMES G. TOWNSEND, Chief of the Public Health Service's division of industrial hygiene, has been serving as Chairman of the Medical Advisory Committee on Beryllium to the industry, which also includes the medical directors of the manufacturers. Since the manufacturing changeover will not take place until the end of June, and there is a stockpile of fluorescent lamps already made, the Advisory Committee emphasized again the instructions it has issued in the past concerning the health hazards in the destruction of these lights, reiterating its assertion to the general public that there is no danger whatever from the lights when they are intact, and that the possible dangers come only in the destruction of old lights. Recently there have been reports of children who cut themselves on broken lights; the cuts healed slowly and often suffered swelling. The Committee repeated its original statement that such cuts do not cause any general sickness or spread further on the body. Surgical care is necessary if they refuse to heal after a period of time. Although precautions should be taken against breathing the dust from broken fluorescent lights, there is no record of any person suffering injury from breathing dust from the occasional breakage of a lamp, despite the millions of lights in use. The Committee also reissued its instructions on the safest way to dispose of used fluorescent lights. If there are only a few to be broken occasionally, they should be broken out of doors in a waste area or in a waste container, and the person breaking them should avoid breathing the dust or vapor that arises. The second situation in which there is a possible danger is the breaking of large numbers of fluorescent lamps, either intermittently or regularly, when hours may be occupied in the operation. Instructions in these cases are as follows: (a) Break lamps out of doors in waste disposal area or in a ventilated hood. To avoid unnecessary dust, the breakage is best done within the waste container. (b) The operator should be supplied with, and required to wear, a respirator approved by the U. S. Bureau of Mines for toxic dusts. (c) Ultimate disposal of broken lamps should be such that the public and others will not be unduly exposed to powders. In situations where it is necessary to break the lamps within buildings, it should be done in an isolated room and in a hood, so as to minimize escape of dusts. Sufficient exhaust ventilation should be supplied to the hood to provide an air intake of at least 125 linear feet per minute at all hood openings. It is recommended that broken lamps not be disposed of in an

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PEN-PHETAMINE has been used extensively in industry for the control of dysmenorrhea and the prevention of absenteeism attributable thereto. It has also been found of particular value in the symptomatic relief of SINUS HEADACHE, neuralgia, and other types of pain not associated with organic disease.

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Sig:- 1 or 2 Tablets t.i.d. commencing 2 days before onset of period.

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incinerator, but either be thrown into water or in a dump where they are not likely to be disturbed with evolution of dust. Significant amounts of mercury vapor may be found in the air during the breaking up of fluorescent lamps. In situations where there is frequent or continuous exposure, measurements should be made of the amounts of mercury vapor in the air during the operation. If high levels are found, protection should be provided for the operator. In addition to DR. TOWNSEND, members of the Advisory Committee are DR. M. G. CARMODY, Clifton Products Co., Painesville, Ohio; DR. T. L. HAZLETT, Westinghouse Electric Corp., Pittsburgh; DR. J. M. DeNARDI, Brush Beryllium Co., Cleveland; DR. W. H. MACHLE, Sylvania Corp., New York; DR. A. D. NICHOL, General Electric Co., Nela Park, Cleveland; DR. A. J. VORWALD, Director, Trudeau Foundation and the Saranac Laboratory, Saranac Lake; MR. C. R. WILLIAMS, Industrial Hygiene Field Service, Liberty Mutual Insurance Co., Boston; DR. B. S. WOLF, U. S. Atomic Energy Commission, New York; and DR. HARRY TEBROCK, Medical Director, Sylvania Products, Long Island, New York.

Cardiac Clinic

THE Cardiac Clinic of the New York University-Bellevue Medical Center has set up a work classification unit to determine the type of occupation persons with heart disease may safely hold in business and industry. The survey, which will take more than a year, will be conducted among the outpatients attending the Bellevue Hospital Thursday Night Cardiac Clinic. The unit is under the direction of DR. LEONARD J. GOLDWATER, and the work is being underwritten by the New York Heart Association. Physicians representing two leading business firms are contributing their time: DRS. JOHN H. ISELIN, JR., of Consolidated Edison and the Chase National Bank, and SIGMUND FALK, New York, of the Emerson Radio Corporation.

—*J.A.M.A.*, June 18, 1949.

These Minor Things

IN A PLANT where adequate facilities are maintained it is found that upwards of 20% of the visits to the clinic are for complaints not in any way related to the worker's job. This might seem to bear out the criticism sometimes heard that the industrial clinics are offering free treatment to the detriment of the general practitioner's income. However, most of these visits are for heartburn, running noses, hangovers, headaches, simple diarrhea, dysmenorrhea, and similar minor complaints. These are not problems that send the patient to his physician. If they go anywhere they might, perhaps, get as far as the drug store. Immediate simple treatment of these minor things enables the worker to stay safely on the job, and if necessary, follow through with his own doctor after working hours. It is also the clinic's re-

sponsibility to make sure that the bellyache is not appendicitis and that the diarrhea is not cancer of the rectum. Many noncritical conditions appear at the clinic, such as diabetes, arthritis, hemorrhoids, varicose veins, etc. They are either sent in by an alert foreman who suspects that something is wrong or they seek the clinic as a first contact for advice or relief. An explanation of the nature and importance of the situation affords the patient the little moral boost which sends him on the way to his own physician.

—From "The Industrial Physician and the Family Doctor," by BLINN W. RUSSELL, M.D., in *J. Maine Med. A.*, April, 1949.

Health Is Personal

HEALTH services are personal services, from one human being to another human being. However imbued with the sense of public service government personnel may be, the three types of medical care which have been traditionally provided by local and Federal government in America—to mental patients, to the tubercular and to the veterans—illustrate the limitations created by governmental responsibility for such personal service. This is not because government employees are not touched by the needs of the sick or are unwilling to assist them. The testimony is uniform from all who have been engaged in this work that (1) the necessary slowness of prudent government administration impedes delivery of a satisfactory level of personal service to the individual; and (2) the uncertainties in any political system make it extremely difficult to get and keep good doctors and other needed personnel. *The assurance being given by spokesmen for compulsory Federal insurance that hospitals will not be taken over by the government and doctors and other health personnel not become employees of the government is fantastic. There is no other way to make such a system work.* The advocates of Federal compulsory health insurance point to inadequacies in the voluntary health system of serving the sick, to certain individuals and to certain remote areas, and because of this claim that all hospital service and all medical service should be provided through the Federal government. Yet the most thoughtful and effective Federal government programs have relied upon local cooperation. Compulsory Federal health insurance would make such cooperative ventures no longer possible. One does not cooperate with the "boss." The "boss" exercises his will. And this could not be otherwise since, under such a complicated system as national compulsory health insurance would require, responsibility could not properly rest upon the Federal government without complete control.

—*Blue Print for Health*, Summer, 1949.

Sound Hazards

SYSTEMATIC studies of sound levels in noisy industries, particularly competent data on the capacities for hearing of the individual prior to employment, and during employment, are needed if industry is to meet com-

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pensation claims in this field, DR. WILLARD MACHLE, industrial consultant, said recently. "It would appear that the first step in any program should be the institution of pre-employment audiometric examination of all workers who are likely to be exposed to high noise levels," DR. MACHLE suggested. "Hand in hand with this, repeated surveys of the worst exposed groups of employees is indicated, and study of the magnitude and spectrum of noise at various places in the occupation should be carried out. Suggesting the desirability of screening new employees for susceptibility, DR. MACHLE said there were few studies or reports on the application of this method, but that it should be tried as part of any systematic study of this problem in industry. "The question of compensation for hearing loss in industry is becoming more important," he continued. "As a result of studies by the American Medical Association, we now have almost complete agreement upon methods for evaluation of hearing loss. Our problem now is the relating of any existing losses to exposure in employment. The large number of variables make interpretation of isolated cases difficult, if not impossible. Too little is known about the importance of many variables, and we are all too often in the position of having no pre-employment, or repeated annual, audiograms on exposed workers." Since high industrial noise levels are associated with deafness, which may be permanent, DR. MACHLE emphasized, the obvious and direct attack is by reduction of noise level in the working environment, adding that there is no reason for the continuance of general noise levels in certain industries at magnitudes, which have been shown to produce loss of hearing.

—*Health on the Job*, May, 1949.

Non-Wage Payments

WAGES paid for time worked understate the direct labor costs of doing business by a significant amount. The average non-wage payments of the companies in the national survey represent an addition to the labor costs of doing business equal to 15.4% of the total wage bill. In money terms, non-wage payments represent an additional 20.5 cents per hour worked, or $424 for each employee. There is a wide range in non-wage payments among firms and industries. While the average non-wage costs amounted to an addition of 15.4% to the total wage bill, the range for individual companies was from less than 5% to more than 42%; the average for individual industries ranged from 9.8% to 23.4%. Non-wage labor costs have grown tremendously in importance in the last 20 years.

—From "The Hidden Payroll," a Research Study by the Chamber of Commerce of the United States.

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report these facts about Athlete's Foot:

[*From ARCHIVES OF DERMATOLOGY & SYPHILOLOGY, April 1942, pp. 670-675*]

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DR. PILGRIM

TO THE annual meeting of the CENTRAL STATES SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY at the Palmer House, where seeing many friends, among them MILTON KRONENBERG, WILLEMS, PETERSON, JANSEY, JOHNS, CONLEY, HOLE, WELLMERLING, and later to FRANK HAMMOND'S room for refreshments and there meeting DRUECK, SLOBE, CHIVERS, GARDINER, REST, and CALLAHAN, and many others; and then to the panel on "Medical Economics," which included many phases (health programs, compulsory insurance, union demands, etc.) and was a great success, for which congratulations to the Program Chairman, DR. GLENN GARDINER....AND at the desk, dictating proceedings of long and interesting meetings, with plans for various projects and journeys in between ....AND presiding at this season's last meeting of the Chicago Section of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION, where was good attendance to hear DR. SILAS M. EVANS in "Experimental Studies on Fibrosis-Producing Dusts"....AND enjoying much the vist of DAN and ESTHER SCHNEIDER, of Boston, long-time friends since 25 years ago when doing post-graduate work at Harvard; and with them

to the club for dinner and visiting....AND in the interim enjoying the symphonies, especially the CBS orchestra which rendered well Handel's "Concerto Grosso" and Brahm's "Serenade"; also later Dvorak's New World Symphony, and more recently Herman Goetz's Symphony in F Major, which George Bernard Shaw has characterized as the best symphonic music since Beethoven; and also Khachaturian's Violin Concerto so well played by Louis Hoffman, and a little later listening to a continuation of the radio program "It's Your Life," dealing with problems of juvenile delinquency on this broadcast....AND then to central Ohio where was a community atmospheric pollution problem on trial in one of the courts, with many conferences and inspections to renew impressions and information; and in the meantime, occupied with the reading of mystery stories, some good and some otherwise, and finding a piano in the hotel and giving a small but select concert which covered a wide variety of selections; and finally being able to assist in the problem by giving evidence for almost a whole day, during which there appeared to be some theoretical considerations one had not encountered before ...AND hearing of the retirement of Federal Judge Tillman Davis Johnson, of Salt Lake City, probably the oldest living jurist, who retired at the age of 91, bringing back memories of a trial at Salt Lake City some years ago, where he presided, even at that time being beyond retirement age and having said repeatedly that he had saved the government a lot of money by continuing and that he had appointed several of his friends to tell him when he "slipped" mentally or physically....AND reading about the

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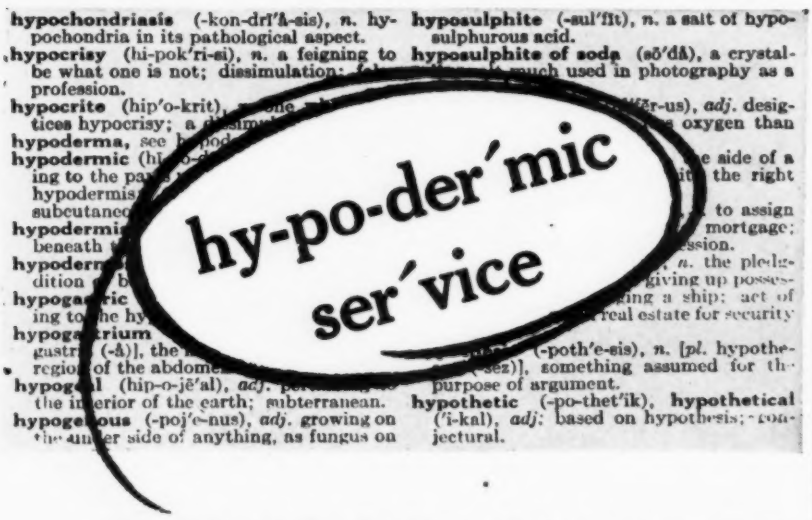

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use of the fog filter to take out the effluent of industrial stack contaminants and thus to control smog—remindful of "fighting fire with fire". . . .AND preparing for the Annual Convention at Atlantic City, with respect to a special meeting of the committee and consultants on workmen's compensation problems, and also the section and other meetings; and enroute with CARL PETERSON and BILL HOLLOWAY, with the exchange of many an experience; and, after finding quarters, lunching with FRANK DICKINSON, and arranging for the luncheon of the next day; and talking at length with DR. RAY HUSSEY and BILL HOLLOWAY about the various problems to be discussed; and next day at the all-day meeting, at which were the consultants, FRANK DICKINSON, BILL NICKELS, HENRY SAYER, DR. HARRY SPAULDING, and TED WATERS, and various members of the committee, including DRS. HUSSEY and JOHNSTONE; and later to various State headquarters, including Missouri, at which were CONNY WANTZ and FREDDY REIN; and at the California headquarters meeting DON CASS, and that same evening at dinner with DR. and MRS. ROBERTSON WARD, (she being ELIZABETH TERRY, the daughter of WALLACE TERRY, the famed San Francisco surgeon of earlier years) . . . . AND continuing at the convention, having luncheon with ROGER LEE and talking of the old days at Harvard, particularly concerning PROFESSOR WILSON, who recently was placed on the advisory board of the National Cancer Society, and also having luncheon with PHILIP DRINKER, MANFRED and ELFREDA BOWDITCH, and RED and ORPHA JOHNSTONE; and sitting with the committee on industrial medical education for several hours and learning that there are differences of opinion as to what to teach and how much; and encountering ADMIRAL BOONE in the elevator, and remembering his report at Pittsburgh, with a short conversation. . . .AND sitting in the section meeting with DRS. ART VORWALD and GEORGE WRIGHT, and later speaking with DRS. WHITTAKER, HOLMBLAD and POOLE, and afterward lunching with TONY LANZA, and visiting the Wisconsin headquarters with DRS. PETERSON and SANDER . . . .AND enroute to Chicago, having dinner with FRANK DICKINSON, HOWARD CARTER, and PROF. GEORGE WAKERLIN, with very interesting conversation concerning the serving of soft drinks at medical exhibits. . . .AND back at the desk and in the laboratory preparing for another investigation; with much telephoning meanwhile amid preparation of reports. . . . AND enroute to northern Ohio for the investigation of a dust problem, which disclosed little basis in fact, after seeing the processes and investigating by the taking of samples; and homeward reading a mystery story titled "Atomsk" which apparently will arouse considerable feeling among communistically-inclined people, and no doubt will be read, as prophesied in the foreword, by many an important official in the politboro. . . .

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[1] The Art of the Vatican, by Mary Knight Potter
[2] Classical Sculpture, by A. W. Lawrence

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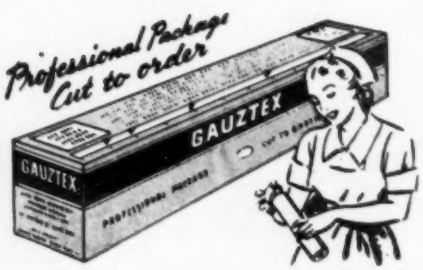

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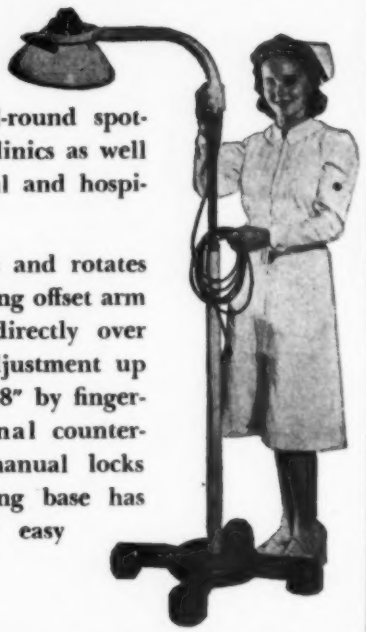

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*Nuzum, F. R.: In Diseases of the Digestive System, ed. by S. A. Portis, Lea & Febiger, 1944.

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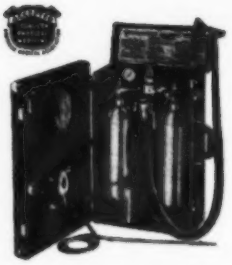

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1. Friedlaender, A. S., and Friedlaender, S.: Annals of Allergy, 6: 23-29, Jan.-Feb., 1948.

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